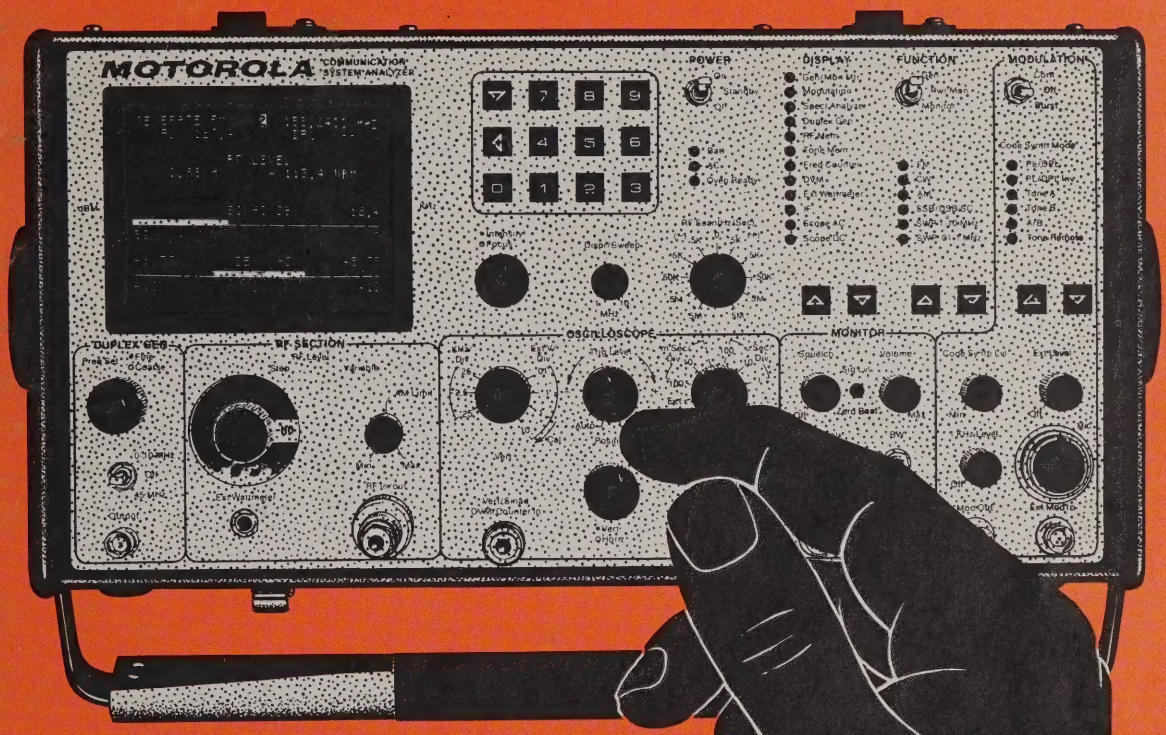
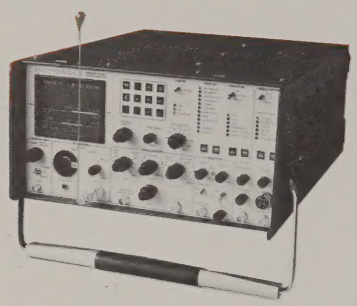
MOTOROLA

1982-83



RADIO COMMUNICATIONS TEST EQUIPMENT

See these NEW outstanding Motorola products featured in your 1982-83 Test Equipment Catalog

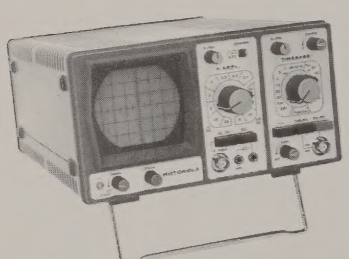


R-2001B COMMUNICATIONS SYSTEM ANALYZER . . .

More than just a service monitor; this microprocessor controlled instrument performs multiple functions that would require many separate instruments for communications servicing. Pages 4-13.

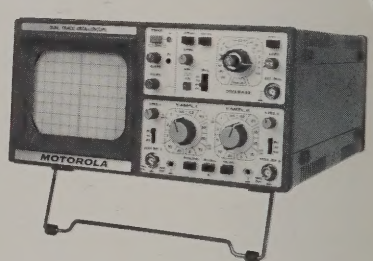
R-1025A, R-1027A FREQUENCY COUNTERS . . .

The R-1025A Frequency Counter measures frequency from 20 Hz to 1000 MHz and has a Tone Multiplier for making quick and accurate PL Measurements. The R-1027A Audio Counter measures frequency from 5 Hz to 80 MHz. Pages 18 & 19.



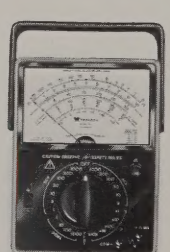
R-1028A, R-1029A OSCILLOSCOPES . . .

These are high quality portable Oscilloscopes. The R-1028A is a DC to 10 MHz single trace oscilloscope. The R-1029A is a DC to 20 MHz dual trace oscilloscope. Pages 28 & 29.



R-1024A DIGITAL MULTIMETER . . .

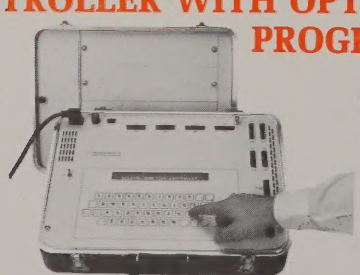
This handheld type Digital Multimeter provides 29 switch selected ranges, all overload protected. Page 37.



R-1026A VOM . . .

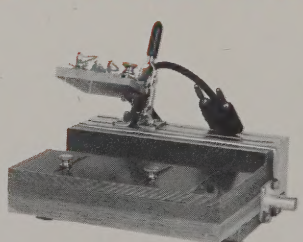
This extra rugged VOM is overload protected in all 22 ranges. Page 38.

R-1800A DIGITAL ANALYZER CONTROLLER WITH OPTIONAL READER—PROGRAMMER. . .



The Digital Analyzer Controller forms the nucleus of a digital service system designed to offer a full range of comprehensive programmed testing and diagnostic functions. Initial applications include reading and programming code plugs and memory modules for synthesized radios. Pages 56 & 57

RTL-1005A PAGER RADIATION TEST FIXTURE



. . . Serves as a radiation test fixture, a holding fixture, and an analyzing fixture which accommodates all Motorola pagers back to Pageboy 1. Pages 66 & 67.

use our handy reply for
more information

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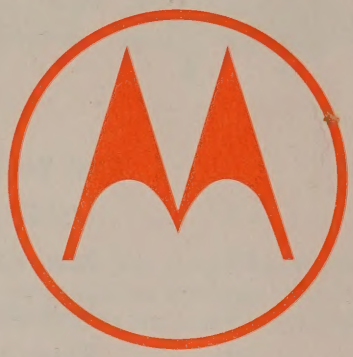
THE TOTAL LINE OF RADIO COMMUNICATIONS TEST EQUIPMENT



Motorola provides you with a complete line of test equipment, designed and manufactured especially for two-way radio servicing.

A dependable, economical Motorola instrument is available for virtually any two-way radio service need. Motorola instruments are designed to meet your precise needs, and at low cost.

With Motorola test equipment, you get:

- Most advanced field service oriented equipment
- High reliability
- Extreme ruggedness
- Portability

Plus, Motorola test equipment engineers are constantly at work designing the newest test equipment and improving existing service aids. It's a formal program to continually help you improve, speed-up and simplify your maintenance techniques. All to save you time and money.

As an acknowledged leader in two-way radio communications, Motorola is dedicated to fully supporting both the two-way radio user and the service technician . . . Dedicated to helping you maintain peak operating efficiency at minimum cost.

GENERAL PURPOSE

COMMUNICATIONS SYSTEM ANALYZER

R-2001B COMMUNICATIONS SYSTEM ANALYZER

FEATURES

- Signal Generator and SINAD Meter
- Off-the-Air Monitor
- Power Monitor
- Spectrum Analyzer
- Code Synthesizer
- Duplex Generator
- Frequency Counter
- Digital Voltmeter
- Oscilloscope
- Sweep Generator
- Frequency and Tone Code Memory
- Optional IEEE Bus

Efficiency . . . whether that means saving time or money, the effect can be great, either servicing on a bench or from a vehicle.

Consider these savings of the Motorola Communications System Analyzer:

- **It performs the functions of many separate instruments costing thousands of dollars more in total.**
- **Less time is spent hooking up test equipment.**
- **Less equipment is transported to the field, needing less time to do it.**
- **Less time is spent adjusting and reading.**
- **All measurements are centralized on the large CRT.**
- **Data entry is keyboard fast.**
- **Readouts are autoranging and combine the accuracy of a digital display and the convenience of an analog "meter-bar."**
- **Commonly used frequencies, tone codes and timing sequences are stored, electronically. And recalled almost instantly.**

The Motorola Communications System Analyzer is a versatile, rugged, compact, and portable test instrument, designed specifically for the service and monitoring of communications equipment. Its functions supersede those of a Service Monitor, expanding the features and capabilities to the point where a new era in servicing is afforded with a single instrument, rather than a host of separate equipment.

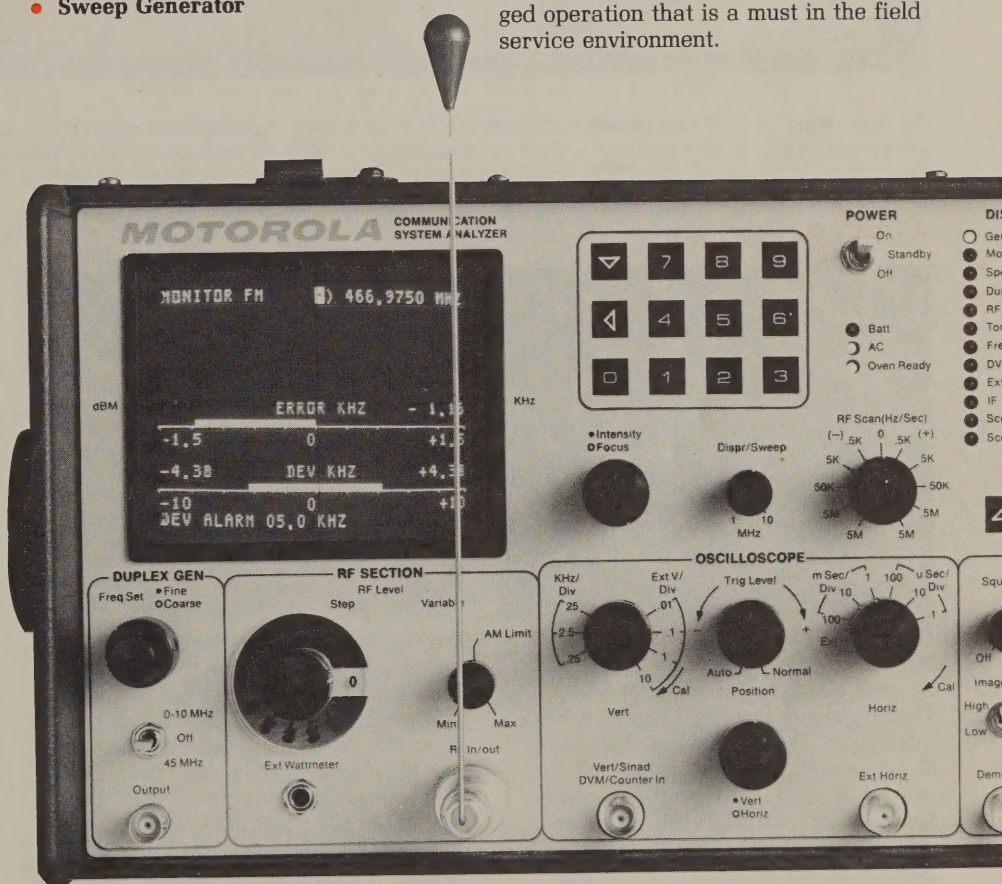
The Motorola Communications System Analyzer is designed to improve a technician's efficiency and accuracy. Consequently, the cost of servicing can be reduced since the Communications System Analyzer performs functions that require many separate instruments. Servicing can be done faster because less time is spent hooking up equipment for testing, let alone the time a technician spends just transporting equipment to and from a field installation. The Communications System Analyzer was designed and built by Motorola, a result of our years of leadership experience in the land-mobile radio field.

Not only does the Communications System Analyzer perform the functions of signal generation, frequency error and deviation measurement, but it is also capable of a variety of tests normally associated with these devices:

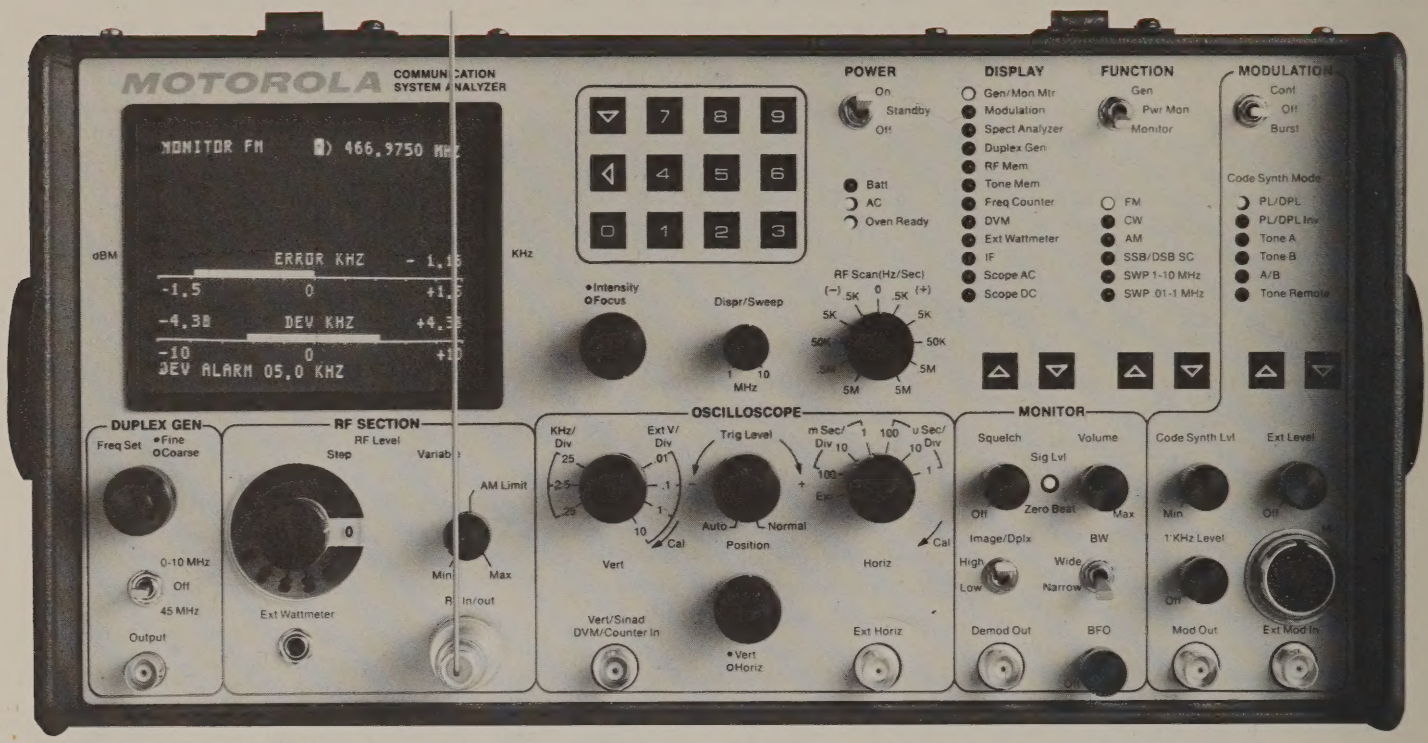
- **Spectrum Analyzer**
- **Duplex Offset Generator**
- **Modulation Oscilloscope**
- **Frequency Counter**
- **AC/DC Digital-Analog Voltmeter**
- **RF Wattmeter**
- **General Purpose Oscilloscope**
- **Multi-Mode Code Synthesizer**
- **SINAD Meter**
- **Sweep Generator**

All functions, generated or monitored, are presented in one area, on one display, rather than several areas of the instrument or on different instruments. The large, clear 8 cm x 10 cm cathode ray tube (CRT) display presents pertinent data in both analog and digital formats. There is no longer any guesswork when reading a meter face or looking at a generator dial. The presentation not only shows you the desired information, but also tells you exactly what function is being displayed. There is no need to look at function selectors either, as the display tells you how the various control switches are set.

At the heart of the Communications System Analyzer's operation is a Motorola M-6800 series microprocessor. The use of this device permits keyboard entry of data, autoranging of displays, fast frequency access, permanent storage of often used frequencies and codes, as well as the reliable, rugged operation that is a must in the field service environment.

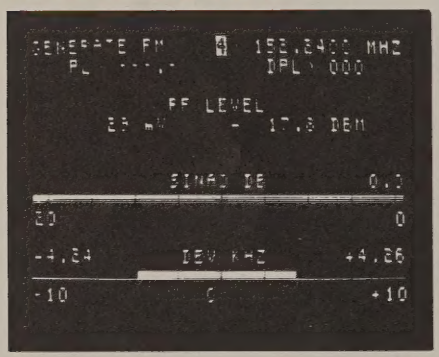


COMMUNICATIONS SYSTEM ANALYZER

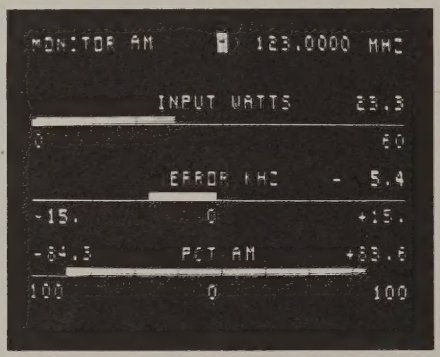


The front panel of the Communications System Analyzer is human engineered for ease of operation. All controls associated with a function are grouped together and each area of the panel is clearly labeled. As each control is manipulated, the display CRT immediately registers the change. The array of displays shown are just a few of the over thirty available for servicing communications equipment.

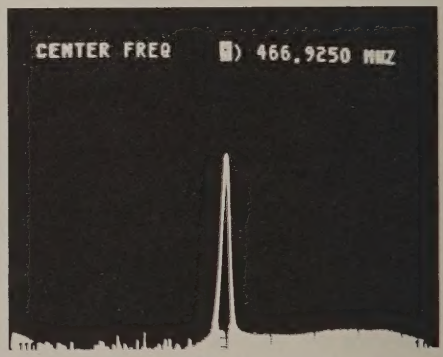
SAMPLE DISPLAYS



Generate FM—When generating an FM signal, the carrier frequency is indicated, with the Private Line (PL) or Digital Private Line (DPL) code, when applicable. The RF level in Volts, plus the corresponding dBm value, are displayed. SINAD and Deviation are displayed numerically and by an intensified analog line segment, similar to a horizontal bar graph. Each line segment varies continuously based on the signal being generated.

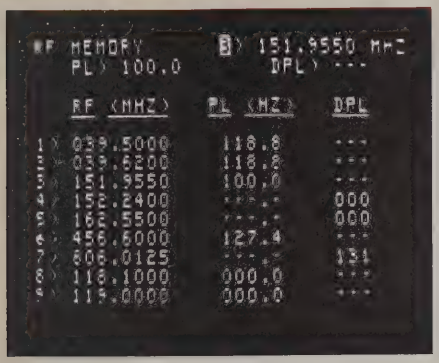


Power Monitor AM—Here an AM transmitter is connected directly into the RF input of the Communications System Analyzer, with frequency in, power in, frequency error and percentage of AM modulation displayed. Each line segment varies according to the input, as do the equivalent numerical indications. As the full-scale range of a display is exceeded, it auto-ranges to track the measured values, bringing them into proper perspective.



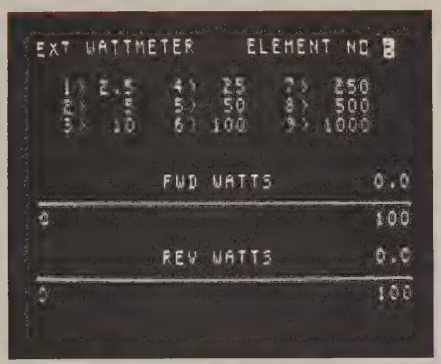
Spectrum Analysis—The Spectrum Analyzer display shows a window of the RF spectrum, varying in width from 1 MHz to 10 MHz, dependent upon the dispersion setting on the front panel. Center frequency of the signal is indicated to an accuracy of 100 Hz.

SAMPLE DISPLAYS



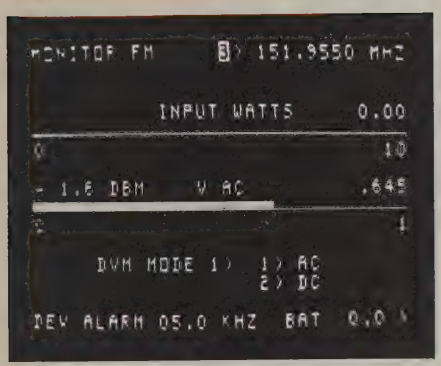
RF Memory Table—Often used frequencies are stored in the RF Memory, accompanied by associated "Private Line" and "Digital Private Line" codes. Each is cursor selected for monitoring or generating. The user programmable table is part of the non-volatile memory, and remains intact even when the instrument is turned off or unplugged.

Tone Memory Table—The Tone Memory Table stores timing sequences and operates like the RF Memory. The first 4 sequences in the table are pre-programmed, non-changeable standards for use on a wide variety of Motorola and other manufacturer's equipment. The remaining sequences can be user programmed based on specific requirements. Sequences are cursor selected, as are the tone frequencies.

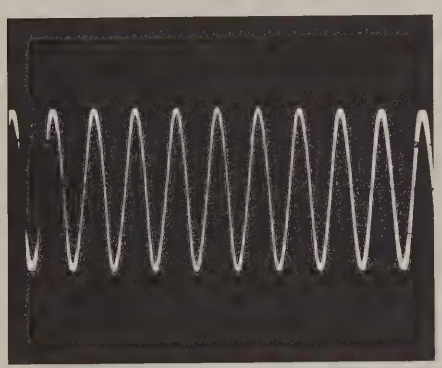


In-Line Power Measuring—By using Motorola's ST-1200 series Wattmeter elements, the Communications System Analyzer measures forward and reflected power from a transmitter. The correct range for the system under test is cursor selected. Power is shown by analog line segments and the digital readout to the right of each line.

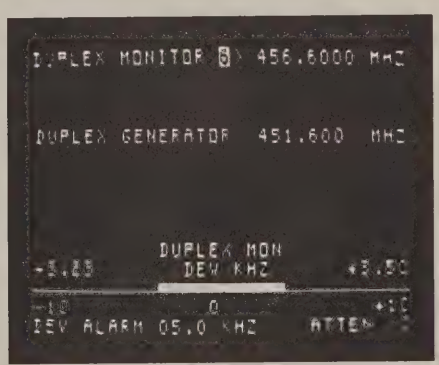
SAMPLE DISPLAYS



Digital Volt Meter—Selecting the Digital Volt Meter (DVM) enables the Voltage metering capabilities of the Communications System Analyzer. AC or DC mode is selected by the cursor. The analog line segment and digital readout indicate the voltages measured. The auto-ranging display measures 1, 10, 100 or 300 Volts full scale. Optional Battery Pack voltage is also shown on the DVM display.



General Purpose Oscilloscope—The general purpose Oscilloscope display is AC or DC coupled, as determined by the display selector. Internal or external inputs allow observation of both generated and monitored modulation signals. An additional benefit of the scope is the IF mode, which displays the modulation envelope of the instrument's IF amplifier.



Duplex Generator—The Duplex generate mode enables this display. It shows the monitored and generated frequencies, deviations and deviation alarm limit. Frequency offset is adjustable from 0 to ± 10 MHz, or can be set at ± 45 MHz when servicing 800 MHz transceivers.

COMMUNICATIONS SYSTEM ANALYZER

Cathode Ray Tube and Controls, Power, Display Mode and Function

FEATURES • BENEFITS

GENERAL

Motorola Microprocessor—The Motorola M-6800 series microprocessor is used in diversified applications throughout the electronics industry. In the Communications System Analyzer, its use permits extraordinary variety in service applications, through presentation of all generated and measured parameters in one integrated, digital-analog, auto-ranging CRT display. • It formats data, provides fast frequency access and controls memory storage and recall, thus offering the two-way land mobile service community a single instrument capable of performing the functions of a service monitor as well as those of many other pieces of test equipment.

Field Environment Tough—Each component that goes into the Communications System Analyzer is thoroughly inspected to ensure high reliability. Careful mechanical design allows the instrument to pass stringent tests for vibration and shock. It meets the shock and vibration portions of EIA test RS152B, the same specifications met by Motorola mobile radios. • This minimizes failures when the instrument is used in a mobile service van, and means it is as tough as the radios it services. And at the site, front panel components are protected from impact by bezel extensions on each side of the cabinet.

Human Engineered—The comfortable handle, coupled to the size and weight of the Communications System Analyzer, enables easy carrying. While the unit is rugged, it's easy to transport, not just in a van, but also by hand. • The position of the handle lets the unit "hang" naturally, close to the body, so it's just like carrying a suitcase.

Single Information Display—The large, clear 8 cm x 10 cm CRT presentation provides all information in a continuously auto-ranging digital-analog display of selected parameters. • Instead of looking at different instruments, or searching the panel of the instrument for settings, the technician need only go to one point on the Communications System Analyzer for information.

Programmable, Non-Volatile Memory—Generated and monitored RF frequencies, tone codes and timing sequences can be programmed to save time and eliminate entry errors. Most commonly used frequencies are stored in the RF and TONE memories for immediate user access. The Communications System Analyzer can also be programmed to a predetermined mode of operation when first turned on. • This is especially time saving when the instrument is continuously used to service one particular type of equipment. These programming functions are all non-volatile, i.e., when the instrument is turned off after use, they remain in the memory.

AM, FM, CW, DSB Signal Generator—The built-in general purpose signal generator provides continuous coverage of the HF, VHF, and UHF land mobile spectrum for receiver testing. With this feature, many forms of external and internal modulation can be simultaneously impressed on the carrier frequency for actual composite signals. The frequency range of the RF signal generator is from 10 kHz up to 1000 MHz, in 100 Hz steps. • Receiver testing time is reduced as less time is spent on "hook-up" and less equipment is needed.

Modular Construction—The Communications System Analyzer is designed to be serviced quickly and easily, should a breakdown occur. The majority of the circuitry is on seven modular plug-in circuit boards which have built-in metering and test points that aid in isolating the problem to a specific board. • Once the board is located, simple plug-in replacement gets the instrument back in service.

System Warnings—To further aid the technician in servicing, visual warnings will appear on the CRT when certain overload or caution conditions exist. Displays warn of low battery power, overheating of the RF load, or an improper attenuator setting for particular measurements.

In addition, a continuous audible tone sounds when a preset deviation limit is exceeded in monitor modes. This limit is entered by using the keyboard and may be programmed from 0 kHz to 99.9 kHz, with 100 Hz resolution. • These built-in warnings are designed to aid the technician in obtaining accurate readings and to prevent damage to the instrument.

FEATURES • BENEFITS

DISPLAYS AND FUNCTIONS

Bright, Clear CRT Presentation—Modes of operation are indicated in large characters on the display, so there is never a question of what is being measured. Digital readouts are visually aided by the use of the continuously auto-ranging analog line segments, which are similar to a bar graph. Each has a base line and calibration markers, in addition to the intensified segment showing the measurement. • All measurement parameters are crisply displayed on the large, clear CRT (8 cm x 10 cm), allowing instant recognition of measurement results and generated signal information.

Keyboard Entry—Numbered keys are used for entering data, such as frequencies and codes. Arrow keys are used to step the cursor horizontally or vertically, and to select some operating functions. • The keyboard is easy to operate and helps to minimize errors by providing fast, precise settings.

Versatile Power Supply—The Communications System Analyzer may be powered by a variety of sources: AC at 110 or 220 Volts, 50/60 Hz; DC from an external 12 Volt source such as a service vehicle; DC from an optional battery pack. • Servicing can thus be accomplished wherever the equipment under test is located.

Display Control/LED Indicators—The user selectable displays are listed in a column beneath the DISPLAY heading on the front panel. Choosing a display is accomplished by pressing an arrow button below the column, for up or down movement, as required. When the appropriate arrow is pressed, the LED adjacent to the selected display illuminates. • Its bright glow eliminates any question of which operating mode and accompanying display have been chosen. FUNCTION is selected in the same way, providing rapid, accurate changes in service capability at the touch of a button.

AM, FM, and Sideband Modulation and Measurement—With the Communications System Analyzer's capabilities, all of the following radio types may be serviced: FM two-way radios and paging systems, citizens band, AM transceivers and pagers, high frequency SSB including marine, amateur and military equipment, and most types of AM, FM or SSB transmitters and receivers operating between 1 MHz and 1 GHz. • It provides the utmost in versatility and cost effectiveness with convenience of just one test instrument.

SINAD Metering—As a comprehensive check of receiver performance, the SINAD measurement is unmatched. The analog line segment and digital representation of SINAD appear automatically whenever the unit is in the normal generate mode. The only hookups required are from the Communications System Analyzer to the RF input of the receiver under test, and from the audio output of the receiver to the instrument's multi-purpose input. • The measurement, and appropriate servicing, can then be accomplished without the need for a separate signal generator, SINAD meter or distortion analyzer.

Terminated RF Power Measurement—RF power is automatically measured when the Communications System Analyzer is in the Power-Monitor mode. The built-in dummy load dissipates up to 50 watts for three minutes and up to 125 watts for one minute. If a high power transmitter should be keyed into the unit for any longer, the CRT display changes to read "RF LOAD OVER-TEMP," thus warning the technician to un-key. • This instrument function is further enhanced by the simultaneous indication of RF power output, carrier frequency error, and modulation, all on the same CRT display.

Spectrum Analyzer (Built-In)—In this mode of operation the CRT displays a window of the RF spectrum whose bandwidth (from 1 MHz to 10 MHz) is determined by the DISPERSION/SWEEP control. The center frequency of this window ranges from 2 MHz to 1,000 MHz, selectable by entering a specific center frequency with the keyboard.

This center frequency, accurate to 100 Hz, is digitally displayed at the top of the CRT screen, eliminating the need for an external signal generator, and counter to provide markers. Once a signal is centered on the screen, positive identification is aided by switching the Analyzer to MONITOR AM or FM and listening to the demodulated output via the built-in audio amplifier and speaker.

The spectrum can be scanned up or down at rates varying from 0.5 kHz per second to 5 MHz per second, using the RF scan control. Slow rates are used to precisely determine a subject signal's frequency while faster rates are used for locating intermittent transmissions or viewing large areas of the spectrum in a short time.

• Other benefits derived by use of the Spectrum Analyzer are: Intermodulation interference identification, IF and RF signal tracing, transmitter harmonics measurement, and checking for spurious outputs from transmitters or receiver local oscillator radiation.

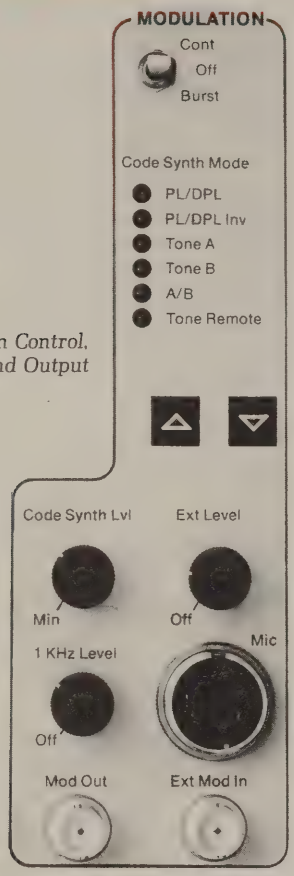
Frequency Counter—The frequency counter measures inputs in a range from 10 Hz to 35 MHz. Its 5 digit auto-ranging output is displayed on the CRT and allows precise measurement and setting of offset oscillators, 35 kHz and 455 kHz pager IF's, PL frequencies and other external input signals. This function will also operate simultaneously with the generate or monitor receiver modes of operation.

AC/DC Voltmeter—Switching to the DVM mode provides a digital-analog voltage presentation on the CRT, along with the corresponding dBm value. The auto-ranging display provides full scale deflections of 1, 10, 100 and 300 Volts, with 1% of full scale accuracy in the DC mode and 5% of full scale accuracy in AC. AC or DC measurement is selected by using the cursor. • The meter's wide dynamic range and three digit display are ideal for setting power supply voltages, checking bias levels, and setting audio levels. Like the Frequency Counter, the DVM will operate simultaneously with generate or monitor operation, if selected.

COMMUNICATIONS SYSTEM ANALYZER

FEATURES • BENEFITS

ANALYZER SECTIONS



Modulation Control, Input and Output

Multi-Mode Code Synthesizer—The Communications System Analyzer generates Private Line tones (PL), Digital Private Line codes (DPL), two-tone sequential paging codes and tone-remote base signaling tones, all of which are available at the Modulation Output jack, as well as being used internally to modulate signals. • This eliminates the necessity of using separate generators and oscillators for general servicing, setting transmitter deviation or checking tone-remote-base control lines. Timing seqences are also stored in the Tone Memory to provide fast set-up and eliminate errors. User programmable timing sequences are also provided to allow the storage of non-standard or future time sequences.

Simultaneous Modulation—In addition to the Code Synthesizer, modulation is also simultaneously available from an independently adjustable internal 1 kHz tone generator as well as from external inputs. The external modulation can be voice from a standard mobile radio microphone (which plugs into the front panel of the instrument), as well as a signal applied to the external BNC input. Separate controls are provided for independently setting the levels of the Code Synthesizer, 1 kHz tone and external modulation sources. • This provides composite signals for testing Private Line systems with actual voice or test tone modulation. The 1 kHz test tone is also a convenient source of modulation for making SINAD measurements. A MOD OUT connector provides external access to all of the modulation signals.

General Purpose Oscilloscope

Monitoring Controls

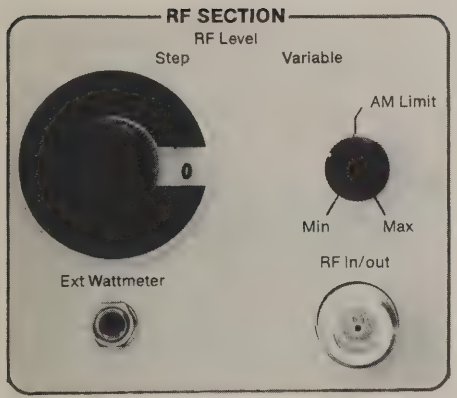
1.5 μV—Off-The-Air Sensitivity—The sensitivity of the Communications System Analyzer receiver allows off-the air monitoring and measurement of transmitter frequency error and deviation to 1000 MHz. Variable squelch aids in picking up weak signals for off-the-air monitoring, but can be set higher to ensure the proper signal-to-noise ratio for measurement accuracy. • This enables frequent parameter checks without leaving the shop, thus spotting system degradation early and keeping service costs down. Bandwidth can be set at Wide for off-channel signal location or wide band FM; or Narrow for maximum sensitivity and selectivity.

500 kHz Oscilloscope—This general purpose scope is ideal for waveform analysis in two-way communication servicing. • Use it for viewing modulation signals (either internally or externally generated), detection of asymmetric modulation or audio distortion.

Sweep Generation—Through use of the Sweep Generator, bandpass characteristics can be determined. • This is ideal for in-depth trouble shooting of IF amplifiers, filters, and FM demodulators.

IF Display—When the IF display mode is selected, the Communications System Analyzer's receiver IF envelope is shown on the CRT. • This array allows the technician to qualitatively and quantitatively assess the amplitude modulation envelope of a transmitted carrier frequency.

Modulation Display—In this mode of operation, the recovered audio waveform, or audio used to modulate the Generator carrier, appears on the CRT. • It is used to graphically measure deviation, and aid in waveform analysis.



RF Section

High Level Calibrated RF Output—The output of up to 1 Volt provides sufficient amplitude to get through misaligned tuners and receivers, and is especially effective when changing receiver frequency. • The high level, clean output is available over the entire frequency range of the Communications System Analyzer.

RF Burnout Protection—At RF levels above 200 mW, in any operating mode, the input automatically switches to the internal 125 watt RF load, • thus protecting the attenuator and signal generator from damage from a keyed transmitter.

Low RF Leakage—RF spray protection allows servicing of pagers, portables and other sensitive equipment with built-in antennas. The Communications System Analyzer is also shielded against high levels of external RF energy, • enhancing accurate operation in adverse on-site locations.

In-Line Power Measurement—Use of Motorola ST-1200 series Wattmeter elements in conjunction with the System Analyzer provides measurement of forward and reflected antenna power on the CRT display • without a complex hookup or use of additional instruments.

WWV Self Calibration—By using a special high resolution analog-digital monitor scale on the CRT, the Communications System Analyzer's time base can be calibrated to 0.5 PPM. • Just tune in the HF WWV signal and adjust the time base oscillator to null the error.

Duplex Generator

Duplex Generator—In this mode, the Communications System Analyzer simultaneously receives and generates the proper signals for duplex radio servicing, while generated and monitored frequencies are observed on the CRT. In the 0-10 MHz range, the 'Freq. Set' control determines proper offset frequencies for VHF and UHF bands. The 45 MHz mode provides a single offset for the 800 MHz range, and a switch is also provided to select high or low side offset, as required. • The Duplex Generator provides enhanced capability to service equipment such as repeaters, car telephones and Emergency Medical Telemetry portables.

COMMUNICATIONS SYSTEM ANALYZER

ACCESSORIES SUPPLIED

Front Cover—Front panel components and the CRT are protected from the elements during transit, or while the instrument is not is use, by the front cover. Ample room is provided for storage of cables, power cord, and other equipment needed for on-site servicing.

Sun Shade—Simply snap on over the CRT to observe selected displays, even in bright sunlight.

Antenna—A BNC connected antenna is provided for convenience in receiving off-the-air signals. When not in use, it stores neatly in the front cover.

Power Cord—The three-conductor cord is supplied for powering System Analyzer by AC, and for use when charging the optional battery pack. Its right angle design allows the unit to stand on end.

Oscilloscope & Meter Probe—A x 1 oscilloscope probe, with attachments, is provided for general servicing needs.

Manual—An owner/operator manual includes all instructions necessary for proper utilization of the Communications System Analyzer.

In-Line Wattmeter Adapter—Allows use of Motorola ST-1200 series In-Line Wattmeter elements for direct measurement and display of forward and reflected transmitter power.

BNC to Type N Adapter

Test Microphone

12 VDC Power Connector Kit

OPTIONAL ACCESSORIES

Battery Pack—A 13.6 Volt battery attaches directly to the back of the unit, providing 50 minutes of continuous operation. Built-in circuitry charges the battery when the power switch is in the "Off" or "Standby" position. When battery power falls below 11 Volts, a warning appears on the CRT display. Cannot be used in conjunction with IEEE-448 Interface Bus or Blower. Can be field installed. Order No. RTP-1002A.

Protective Canvas Cover—A rugged, padded fabric type cover to protect instrument from excessive field wear. Order No. RTL-4056A.

Transit Case—Order No. RTL-4065A

RF Detector Probe—Order No. RTL-4075A

Deluxe Telescoping Antenna—Order No. RTA-4000A

600 Ohm Line Matching Transformer—Use for 600Ω balanced lines—Order No. RTL-1003A

MODEL OPTIONS

IEEE-488 Standard Interface Bus—The Communications System Analyzer is compatible with the IEEE-488 Interface Bus, to enable fully automated testing with the instrument. Contact your Area Office or Test Equipment Consultant for detailed information. Order R-2002B series. See Model Nomenclature in Specifications.

High Stability Oscillator—Use of this oscillator improves stability over the standard TCXO time base to $\pm 5 \times 10^{-8}$ maximum error, over the temperature range of from 0 to 55°C. A front panel LED indicates when the ovenized crystal has stabilized. Order Model R-2001B/HS, R-2001B/HS/220, R-2002B/HS or R-2002B/HS/220, (See Model Nomenclature in Specifications).

MODULE SERVICE KIT

Extender Board Kit—The RPX-4150A extender board kit is an aid for servicing the Communications System Analyzer modules with printed circuit board edges. Use with: A2, A3, A4, A5, A6, A7, A9, and A12 modules. Order No. RPX-4150A

SPECIFICATIONS

Operating/Display Modes: AM/FM/CW/SSB Monitor, AM/FM/CW/DSBSC; Generate, Code Synthesizer, Spectrum Analyzer, Duplex Generator, Memory Tables, Frequency Counter, Digital Volt Meter, Wattmeter, IF Display, Oscilloscope.

SIGNAL GENERATOR MODE

Frequency

Range: 10 kHz to 999.9999 MHz. **Resolution:** 100 Hz. **Accuracy:** Refer to accuracy of master oscillator.

Output (Levelled into 50 Ohms)

Attenuator: 16 dB variable plus 10 dB steps over 13 ranges. **Range:** .1 μV to 1 VRMS (−127 dBm to +13 dBm). **Accuracy:** ±2 dB over the .1 μV to 1 V range of output level; ±2 dB leveling over the 10 kHz to 750 MHz freq. range; ±3 dB leveling over the 750 MHz to 999.9999 MHz frequency range; ±1 dB over the operating temperature range ref. 25°C.

Spectral Purity

Spurious: −40 dB for fc from 250 MHz to 999.9999 MHz; For fc below 250 MHz all spurs within ±50 MHz of fc will be −40 dB. **Harmonics:** −15 dB.

Frequency Modulation

Deviation: 0-50 kHz peak. **FM Residual Noise:** 100 Hz. **External/Internal Frequency Range:** 5 Hz to 10 kHz (±1 dB). **Modes:** Internal, external, microphone or all simultaneously.

Amplitude Modulation

Range: 0 to 80% from 1 to 500 MHz. **External/Internal Frequency Range:** 5 Hz-10 kHz (±1 dB). **Modes:** Internal, external, microphone or all simultaneously.

Double Sideband Supressed Carrier

Carrier Suppression: −25 dB (1 MHz—500 MHz).

MONITOR MODE

Frequency Range: 1 MHz to 999.9999 MHz. **Resolution:** 100 Hz. **Accuracy:** Equal to that of master oscillator time base. **Frequency Error Indicator:** Autoranging CRT display. **Resolution** ±10 Hz for frequency error measurements on 1.5 kHz, 5 kHz full scale ranges; resolution ±100 Hz on 15 kHz full scale range; resolution ±1 Hz on the 50 Hz full scale range. **Input sensitivity: (over the 4 MHz to 999.9999 MHz range)** 1.5 μV for 10 dB EIA SINAD (narrow band ±6 kHz mod. acceptance); 7 μV for 10 dB EIA SINAD (wide band ±100 kHz mod. acceptance). **Spurious Response:** −40 dB typical 0 dB image at ±21.4 MHz; −10 dB at L.O. harmonics ±10.7 MHz.

Deviation Measurement

Range: 1, 10, 100 kHz full scale. **Accuracy:** ±5% of reading ±100 Hz from 500 Hz to 50 kHz deviation; ±10% of reading from 50 kHz to 75 kHz deviation. **Peak Deviation Limit:** Set via keyboard to 100 Hz resolution (0 kHz to 99.9 kHz). Audible alarm indicates limit condition and will be active in all Monitor Modes.

AM Modulation Measurement

Range: 0 to 100%. **Accuracy:** ±5% of full scale.

Built-in RF Wattmeter (Autoranging display)

Frequency Range: 1 MHz to 1000 MHz. **Power Range:** .1 Watts to 125 Watts. **Accuracy:** ±10%. **Protection:** Over-temp indicator.

GENERAL

Spectrum Analyzer

Dynamic Range: ≥75 dB, −105 dBm to +20 dBm range with attenuator. **Frequency Range:** 2 MHz to 1,000 MHz. **Full Scale Frequency Dispersion:** Adjustable between 1 MHz and 10 MHz.

Duplex Generator

Frequency Offset: Adjustable from 0 to 10 MHz plus fixed frequency of 45 MHz (high or low side). **Modulation Level:** Adjustable from 0 to 20 kHz peak deviation.

Oscilloscope

Size: 8 cm x 10 cm. **Frequency Response:** DC to .5 MHz (3 dB point). **External Vertical Input Ranges:** 10 mV, 100 mV 1 V, 10 V (per division). **Sweep Rates:** 1 μs, 10 μs, .1 ms, 1 ms, 0.01S, 0.1S (per division). **Sync:** Automatic or adjustable level triggering.

5 Digit Autoranging Frequency Counter

Frequency Range: 10 Hz to 35 MHz. **Input Sensitivity:** 30 mV from 10 Hz to 1 MHz; 50 mV from 1 MHz to 35 MHz.

Digital Voltmeter

Readout: Auto ranging 3½ digit display, 1, 10, 100, 300 Volts full scale. AC-dBm calibrated across 600 Ohms. **DC Accuracy:** ±1% of full scale ±1 least significant digit. **AC Accuracy:** ±5% of full scale. **AC Bandwidth:** 50 Hz to 10 kHz.

Code Synthesizer

Frequency Range: 50 Hz to 9.9999 kHz. **Resolution:** .1 Hz. **Frequency Accuracy and Stability (with temperature):** .01%. **Output Level:** 0-3 V RMS into a 600 Ohm load.

SINAD Meter

Input Level Range: .5 V to 10 VRMS. **SINAD Accuracy:** ±1 dB at 12 dB SINAD.

Manual Frequency Scan

Step Size: Switch Selectable; 100 Hz, 1 kHz, 10 kHz,100 kHz and 1 MHz (+ or −). **Step Rate:** 5 steps/sec.

Time Base

Standard TCXO: Aging: $\pm 1 \times 10^{-6}$ per year; Temp: $\pm 1 \times 10^{-6}$ maximum error over the 0 to 55°C temp. range. **Optional Ovenized High Stability:** Aging: $\pm 1 \times 10^{-8}$ per year; Temp: $\pm 5 \times 10^{-8}$ maximum error over the 0°to 55°C temp. range (warmup to $\pm 5 \times 10^{-7}$ of final frequency within 20 minutes).

Power and Environmental

AC: 100-130 VAC, 200-260 VAC 47-63 Hz. **DC:** +11.5 VDC to +16 VDC. **Optional Battery:** 13.6 V battery—provides 50 minutes typical operation. **Temperature Range:** 0° to 55°C operating −40° to 85°C storage. **Dimensions:** 8.25 in. high x 15.75 in. wide x 20.75 in. deep; 21 cm x 40 cm x 52.7 cm. **Weight:** 46 lbs. (basic model) excluding battery pack, cover and accessories 20.5 kg.

Model Nomenclature

R-2001B Basic model. **R-2001B/220** Basic model shipped wired for 220 V operation. **R-2001B/HS** With high stability oscillator. **R-2001B/HS/220** High stability oscillator and 220 V operation. **R-2002B** With IEEE-448 Bus. **R-2002B/220** IEEE-488 Bus. and wired for 220 V operation. **R-2002B/HS** IEEE-488 Bus. and high stability oscillator. **R-2002B/HS/220** IEEE-488 Bus. high stability oscillator and 220 V operation.

Optional Accessories

RTP-1002A Battery Pack. **RTL-4056A** Protective Canvas Cover. **RTL-4065A** Transit Case. **RTL-4075A** RF Detector Probe. **RTA-4000A** Deluxe Telescoping Antenna.

R-1200A SERIES SERVICE MONITOR

The R-1200 Service Monitor is a versatile service instrument that provides continuous FM frequency coverage from 100 kHz to 999.9999 MHz. Its advanced design provides the ability to set the synthesizer to 100 Hz increments providing direct "dial-up" of the 470-512 MHz splinter/tertiary channel.

Pushbutton operation provides speed and simplicity of operation. A push of a button changes the mode of operation from receive to CW, FM or AM generation. Outputs include single variable RF output, and a variable level 1000 Hz signal for modulating a transmitter while setting deviation. IF signals can be generated at the same RF output connector. The 1 volt high level RF output lets you get through detuned circuits for fast, efficient receiver servicing.

With the R-1200 you can simultaneously modulate the signal generated with an internal 1000 Hz and an external PL or DPL code. The ability to measure and observe the deviation on a meter and a scope simultaneously is especially significant. The DPL code can be recovered on the "scope out" connector for use with the SLN-6413A DPL decoder for code verification. The scope plug-in is also useful as a general purpose scope as it has a calibrated input with sensitivity of 1 millivolt per division.

FEATURES

"Clean" Output Signal—Spurious signals are at least 40 dB below the desired output at all amplitudes below 110 MHz, improving to – 50 dB above 110 MHz. Harmonies are at least 25 dB below the fundamental.

High Level Output At All Frequencies—A full 1 V RMS is available (into a matched 50 Ohm load) from below 10 kHz to 999.9999 MHz.

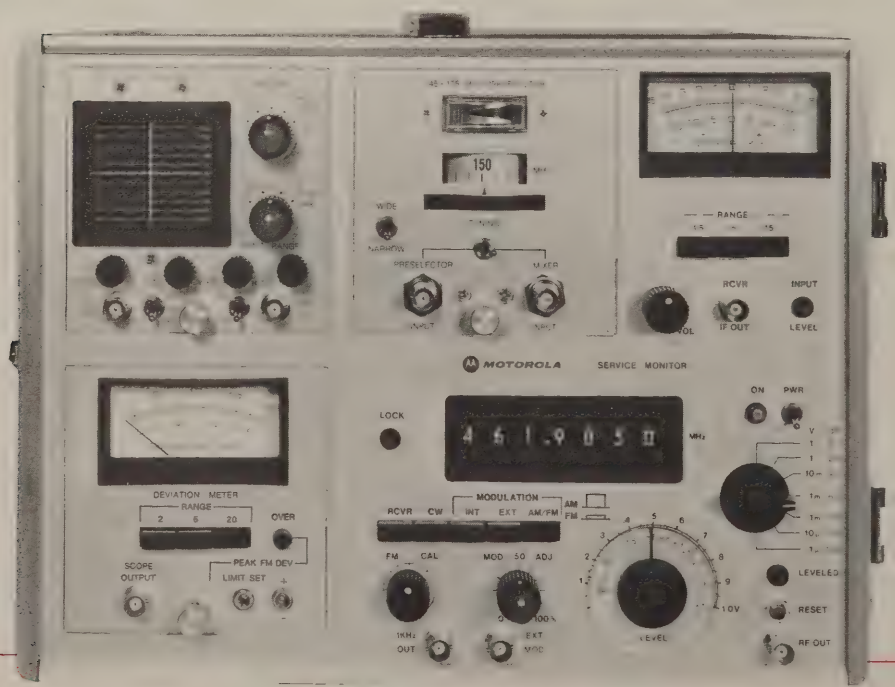
Fully Shielded Synthesizer and Receiver—The service monitor does not generate RF spray and is unaffected by ambient RF.

Electronic Overload Protected—Prevents damage to the synthesizer if an RF (transmitter) or DC source is inadvertently connected to the output connector.

AM, FM, and CW Output—Either internal or external modulation is selected by a convenient front panel switch. AM carries frequency that can be checked at zero modulation.

Digital Capability—Both the frequency and amplitude modulators are DC coupled. The deviation scope and meter are fully compatible with digital systems.

Built-In 13.6 VDC Inverter—The service monitor may be operated from the battery in a service van or other vehicle.



SERVICE MONITOR PLUG-INS

The R-1200 Series Service Monitor incorporates a modular building block concept which allows up to three plug-ins to be added to the unit, thus expanding the usefulness of the instrument by providing auxiliary testing and measuring functions.

BROADBAND MIXERS

These plug-in units provide coverage of the entire RF spectrum from 20 MHz to 990 MHz.

STANDARD FM UNIT

Sensitivity of the standard unit (SLN6352A) is 1 millivolt for "in-shop" measurements and is recommended for general service use.

SLN-6352A Standard Broadband Mixer. Est. shpg. wt. 2 lbs. (90 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

HIGH GAIN BROADBAND FM MIXER

The model SLN-6396A High Gain Broadband Mixer provides better than 20 microvolt sensitivity from 20 MHz to 512 MHz (usable to 990 MHz). An adjustable gain control allows the sensitivity to be adjusted from 1 millivolt, for "in-shop" measurements, to better than 20 microvolts, for "off-the-air" measurements.

NOTE: Not recommended where high selectivity is required such as in areas of high-frequency congestion.

SLN-6396A High Gain Broadband Mixer. Est. shpg. wt. 2 lbs. (.90 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.97 cm).

RF, FM PRE-SELECTOR PLUG-INS

Four RF pre-selector plug-ins are available for "off-the-air" measurements, one for each of the standard FM communications bands; low band VHF, high band VHF, 406-420 MHz UHF and 450-512 MHz UHF. Sensitivity is a nominal twenty microvolts over the rated bandwidth. In addition, each plug-in also incorporates a broadband mixer input (10 mV sensitivity) for general service use over the entire 20-990 MHz range.

SLN-6353A	25-50 MHz pre-selector and wideband input.
SLN-6354A	145-175 MHz pre-selector and wideband input.
SLN-6355A	450-512 MHz pre-selector and wideband input.
SLN-6369A	406-420 MHz pre-selector and wideband input.

HIGH SENSITIVITY BROADBAND AM/FM/SSB PLUG-IN RECEIVER MODULE

Plug this receiver module into your R-1200 series mainframe and expand your service capabilities to include AM and SSB monitoring. A full array of FM, AM and CW carries are provided by the mainframe synthesizer.

In the AM mode modulation percent is indicated on a built-in modulation meter on either 30% (for standard EIA tests) or 100% modulation scales. A plus or minus peak selector allows you to check for asymmetrical modulation. In the FM mode, operation is identical to that of the broadband mixer plug-ins. The SSB mode allows you to monitor single-side-band transmissions. A beat frequency oscillator (BFO) allows for adjustment of the SSB demodulator frequency for crystal clear audio.

The plug-in receiver module features better than 50 microvolts typical sensitivity for meaningful measurement (better than 25 microvolts in the 15 MHz to 500 MHz range).

RTC-4018A Plug-in Receiver Module.

DEVIATION METER

A. The plug-in deviation meter provides direct reading deviation measurements in three ranges, 0-2 kHz, 0-6 kHz, and 0-20 kHz to an accuracy of ±4% of full scale. An indicator light illuminates when peak deviation exceeds pre-set limits. A switch allows you to observe either side of the modulation to check for unbalanced or asymmetrical deviation and a scope output jack is provided for observing instantaneous peak deviation on an external shop scope. DPL compatible.

RTC-4000A Meter, deviation unit. Est. shpg. wt. 2½ lbs. (1.13 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

MULTI-PURPOSE OSCILLOSCOPE

B. The multi-purpose oscilloscope provides a visual display of the exact deviation. Waveform analysis allows you to diagnose unbalanced modulation, power supply hum, clipping, and other abnormal conditions at a glance. The unit may be used in place of or simultaneously with the deviation meter or may be used independently of monitoring function for other servicing procedures. Unit features variable speed sweep. calibrated attenuator, AC/DC coupling, and high (1 mV/div) sensitivity. DPL compatible.

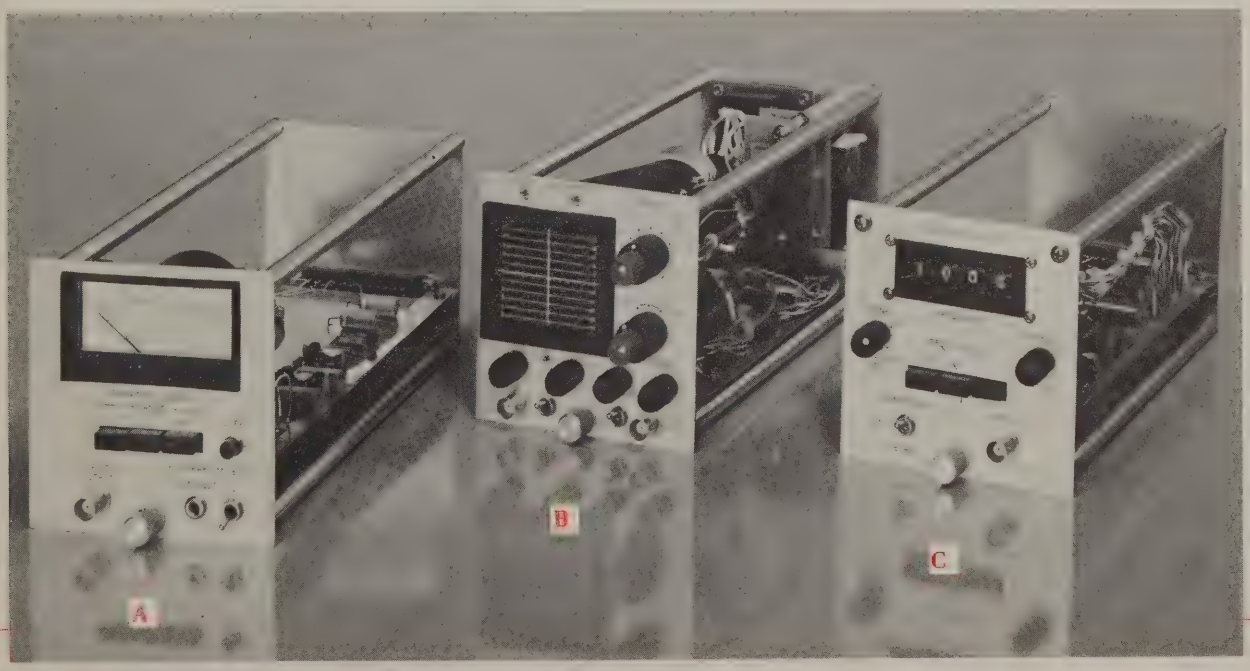
RTC-4001A Scope deviation unit. Est. shpg. wt. 4½ lbs. (2.03 kg). Est. packaged dim 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

AUDIO FREQUENCY SYNTHESIZER

C. The model SLN-6381A Audio Frequency Synthesizer provides low frequency signal generation capability. The output consists of a low distortion sine wave. Accuracy and stability are related to the 1 MHz oscillator in the Service Monitor main frame by a digital synthesis system. No frequency calibration is required in the plug-in.

The unit provides both a continuous tone mode and a burst mode variable from 0 to 1 second. Longer bursts are obtained by simply switching the unit "on" and "off", in the continuous mode, for the desired length of time. Output amplitude is variable up to 3 VRMS into 600 Ohms. Resolution of the output frequency varies with the frequency range from 0.01 Hz in the 10 to 99.99 Hz range to 1 Hz in the 1000 to 9999 Hz range . . . more than adequate for checking all common tone code signalling systems. (Note: for example, at 1000 Hz reeds are within spec at ±1½ Hz.) The desired frequency is selected by four convenient thumbwheels.

SLN-6381A Audio Frequency synthesizer. Est. shpg. wt. 2 lbs. (.9 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).



R-1200A SERIES SERVICE MONITOR

SPECIFICATIONS

Operating Modes: FM/AM/SSB Monitor,Signal Generator—AM, FM, CW.

SIGNAL GENERATOR MODE

Frequency:

Range: 100 Hz to 999.9999 MHz. **Display:** 7 digits individually selectable. **Resolution:** 100 Hz. **Accuracy:** Refer to accuracy of master oscillator.

Output (Levelled into 50 Ohms):

Range: 0.1 μV to 1 VRMS −127 dBm to +13 dBm.

Flatness:*

(@ .5 μV and 25°C)	Maximum
100 kHz—250 MHz	±1 dB
250 MHz—550 MHz	±1½ dB
550 MHz—1000 MHz	±2 dB

Accuracy**

100 Hz—500 MHz:
0 dB, Uncalibrated
Steps 20, 40, 60, 80 dB, ±1 dB
100, 120 dB, ±1½ dB

500 MHz—1000 MHz:
0 dB, Uncalibrated
Steps 20, 40, 60, 80 dB, ±1½ dB
100, 120, dB, ±2 dB

Temperature Variance: ±.5 dB additional over 0°C to 55°C.

*Variance of output as a function of frequency at fixed output setting.

**Additional one-time inaccuracy when switching from range to range.

Spectral Purity:

Harmonics: ≤ −25 dBc. **Non-Harmonic Spurious: 100 kHz—110 MHz:** ≤ −40 dBc. **110 MHz—1000 MHz:** ≤ −50 dBc. **Noise: Residual FM: (.1 to 3 kHz BW): 100 kHz—500 MHz:** ≤50 Hz RMS. **500 MHz—1000 MHz:** ≤100 Hz RMS. **Residual AM: (.1 to 3 kHz BW):** ≤.1% at +13 dBm. **1 Hz BW noise at 50 kHz offset: 100 kHz—500 MHz:** ≤ −103 dBc. **500 MHz—1000 MHz:** ≤ −97 dBc. **Attenuator:** 20 dBm Variable, 20 dBm steps over 6 ranges. **Impedance:** 50 Ohms. **Connector:** BNC. **Output Modes:** AM, FM, CW.

Amplitude Modulation

Range: 0 to 90% at output setting of +7 dB on vernier attenuator. **Rate:** dc to 10 kHz. **Internal Rate:** 1 kHz fixed. **Pulse Response:** ≤40 μs rise and fall. **Dial Accuracy:** ±20% of reading, 5% absolute. **External Input:** Approximately 1 VRMS for 100%, BNC Connector. **Distortion (@ 1 kHz rate): at 30% modulation:** .6% typical, 1.2% maximum. **at 70% modulation:** .5% typical, 2.5% maximum. **at 90% modulation:** 1% typical, 5% maximum. **Impedance:** 600 Ohms. **Incidental FM at 30% AM, 1 kHz rate:** ≤90 Hz. **Modes:** Internal, external or both simultaneously.

Frequency Modulation:

Internal Rate: 1 kHz fixed. **Deviation:** 0 to 20 kHz peak. **Rate:** DC to 15 kHz. **Pulse Response:** ≤40 μs rise and fall. **External Input:** Approximately 1.5 volt peak for 20 kHz peak deviation, BNC connector. **Impedance:** 600 Ohms. **Distortion: at 20 kHz Deviation, 1 kHz rate:** ≤1.2%. **at 20 kHz Deviation, 15 kHz rate:** ≤2.6%. **at 10 kHz Deviaton, 15 kHz rate:** ≤1%. **Incidental AM at 20 kHz Deviation, 1 kHz rate:** ≤.1%. **Modes:** Internal, external or both simultaneously.

MONITOR MODE:

Frequency Range: 20 MHz to 990 MHz, depending on preselector or mixer selected. **Display:** 7 digits individually selectable. **Resolution:** 100 Hz. **Accuracy:** Equal to accuracy of master oscillator. **Frequency Error Meter:** 3 ranges ±1.5 kHz, 100 Hz resolution; ±5 kHz, 200 Hz resolution; ±15 kHz, 1 kHz resolution. **Input Sensitivity:** Function of preselector or mixer selected, 20 μV to 10 mV range. **Receiver IF Out:** 10 MHz, BNC connector. **Squelch Threshold:** Approximately 1 mV with Broad Band Mixer. **Audio Monitor Amplitude:** >6 V P-P into 8 Ohms (>5 Watts). **Distortion:** ≤3% at .5 Watt.

GENERAL

Internal 1 kHz Output Level: 0 to 1 VRMS. **Distortion:** ≤1%. **Connector:** BNC. **Output Protector Trip:** Approximately 10 V peak ±DC and AC to 1000 MHz. **Reset:** Pushbutton. **Indicator:** Levelled LED. **RF Leakage:** At level not to increase IF output test point of a A04FNC pager (.2 μV sensitivity) by more than ½ dB between CW and RCVR operating modes and placed 12 inches (30.5 cm) in front of unit developing .5 μV output into a shielded termination. **Power Required: AC:** 100-130 V AC, 200-260 V AC RMS, 50-60 Hz 90 W max., plug programmable, color coded. **or DC.** 13.6 DC built in inverter, 90 W max. **Indicators:** On—Power Lock—Frequency Leveled—RF Output/Overload. Input Level—Receiver. **Temperature:** Storage: −15°C to +85°C (5°F to 185°F). Operating: 0°C to 55°C (32°F to 131°F). **Weight:** 45 lbs. (20.4 kg) (less plug-ins). **Size:** 14 in. wide (35.6 cm) 19⅜ deep (with cover) (49.2 cm) 10¾ in. high (27.3 cm).

PLUG-INS

Standard Broadband FM Mixer:

Range: 20 MHz to 990 MHz. **Sensitivity:** 1 mV for receiver "turn-on" at 512 MHz. **Connector:** BNC.

High Gain Broadband FM Mixer:

Range: 20 MHz to 990 MHz. **Sensitivity:** 20 microvolts, nominal, for receiver "turn-on" to 512 MHz. **Connector:** BNC.

FM Pre-selectors:

Range: In pre-selector mode; 25-50 MHz, 145-175 MHz, 406-420 MHz, or 450-512 MHz depending on model selected. **In broadband mode:** 20 MHz to 990 MHz. **Sensitivity:** 20 microvolts, nominal, for receiver "turn-on" in pre-selector mode. 10 mV nominal for receiver "turn-on" in broadband mode. **Connectors:** BNC.

AM/FM/SSB Receiver Module:

Range: 100 kHz to 999.99 MHz. **Input Signal:** CW,AM, FM, or SSB. **Sensitivity:** 100 kHz to 8.9 MHz <50 μV; 11.1 MHz to 15 MHz <50 μV; 15 MHz to 500 MHz <25 μV; 500 to 999.99 MHz <50 μV; typical levels for meaningful measurements. **Max. RF Input:** 0.5 VRMS operating. 10 VRMS without damage. **Input Connector:** BNC. **Selectivity:** (3 dB BW 100 μVRMS input). AM, ±10 kHz nom. Narrow FM, ± 8 kHz nom. Wide FM ±150 kHz nom. **AM Modulation Meter:** 0-30% range 0-100% range with ±peak selector switch. **Meter Accuracy:** ±8% of reading up to 95% symmetrical modulation. **Demodulated Output:** AM, 10 mV p-p per 1%. SSB 1 V p-p typical. FM, 0.5 V p-p typical at 3 kHz deviation. **Output distortion:** less than 5% at 80% AM, 1 kHz mod. freq. **Output Frequency Response:** 100 Hz to 5 kHz. **Output Impedance:** 10 k Ohm nom. **Frequency Error Indicator, FM Dev. Meter and Audio Speaker:** on mainframe: **Power:** supplied by mainframe.

Note: Compatible with mainframe serial numbers 14001-7 and up without modification.

Deviation Meter:

Range: 0-2, 6, 20 kHz. **Accuracy:** ±4% of full scale. **Indicators:** Meter (analog). Peak deviation light with preset control. **Frequency Response: DC** −20 kHz. **Connector:** Scope output BNC Jack.

Oscilloscope:

Range: 1.5, 5, 15 kHz deviation; 0.01, 0.1 1, 10, 100 volts/division. **Frequency Response:** 50 kHz. **Inputs:** Internal/external vertical and horizontal, each with separate switches for selection of internal or external input and sync. **Sync. Range:** 3 Hz to 30 kHz. **Accuracy:** ±5%. **Sensitivity:** 1 millivolt/division.

Audio Frequency Synthesizer:

Frequency and Resolution: Three Ranges, 10.00 to 99.99 Hz (0.01 Hz resolution). **Accuracy:** Same as reference oscillator in main frame. **Output Waveform:** Sinusoidal. **Distortion:** Less than 1.5%. **Output Level:** Variable to 3 VRMS into 600 Ohms. **Tone Duration:** Continuous or variable, 0.1 to 1 second burst. **Operating Temperature:** −12° to +55°C.

Time Base Accuracy

Standard: (Not recommended for 200 to 250 VAC operation) 1×10^{-7} from −10° to +55°C; 1×10^{-6} per year aging; 30 min. warm-up. **TCXO:** 1×10^{-6} from 0°C to 55°C; 1×10^{-6} per year aging; no warm-up required. **High Stability:** 1×10^{-8} from −15°C to 60°C; 1×10^{-6} per year aging; 15 min. warm-up.

Time Base Options

Standard Oscillator: This is an ovenized time base which has a warmup time of approximately 30 minutes. It provides 1×10^{-7} (.1 ppm) stability over the −10°C to +55°C temperature range. THIS TIME BASE IS NOT RECOMMENDED FOR 200 TO 250 VAC OPERATION. A field modification can be performed for operation at 200 to 250 VAC but it removes standby power from the crystal oven when the unit is turned off. **TXCO Oscillator:** This is a temperature compensated, non-ovenized time base which provides 1×10^{-6} (1 ppm) stability over the 0° to +55°C temperature range. **High Stability Oscillator:** This is an ovenized time base which has a 15 minute warmup time with a stability of 1×10^{-8} (.01 ppm) over the temperature range of −15° to +66°C.

Aging Characteristics of all of the above is 1×10^{-6} (1 ppm) accumulative over one year. It is an exponential characteristic with the rate of change decreasing after the first three months.

Specifications subject to change without notice.

OPTIONS \ SALES MODEL	R1200AA	R1200AAA	R1200AAB	R1200AAD	R1200AAE	R1200AAG	R1200AAH	R1200AAT	R1200AAAT	R1200AABT	R1200AADT	R1200AAET	R1200AAGT	R1200AAHT	R1200AAX	R1200AAAX	R1200AABX	R1200AADX	R1200AAEX	R1200AAGX	R1200AAHX	R1200AB	R1200ABA	R1200ABB	R1200ABD	R1200ABE	R1200ABG	R1200ABH	R1200ABT	R1200ABAT	R1200ABBT	R1200ABDT	R1200ABET	R1200ABGT	R1200ABHT	R1200ABX	R1200ABAX	R1200ABBX	R1200ABDX	R1200ABEX	R1200ABGX	R1200ABHX	R1200AC	R1200ACA	R1200ACB	R1200ACD	R1200ACE	R1200ACG	R1200ACH	R1200ACT	R1200ACAT	R1200ACBT	R1200ACDT	R1200ACET	R1200ACGT	R1200ACHT	R1200ACX	R1200ACAX	R1200ACBX	R1200ACDX	R1200ACEX	R1200ACGX	R1200ACHX
R1200A Mainframe	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
RTC4000A Deviation Meter	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x																							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
RTC4001A Oscilloscope																						x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
SLN6352A Mixer	x							x							x							x							x							x							x						x							x													
RTC-4018A AM Plug-In		x							x							x							x							x							x							x						x							x									
SLN6353A 25-50 MHz Pre-Selector			x							x							x							x							x							x							x						x							x								
SLN6354A 145-175 MHz Pre-Selector				x							x							x							x							x							x							x						x							x						
SLN6355A 450-512 MHz Pre-Selector					x							x							x							x							x							x							x						x							x				
SLN6369A 406-420 MHz Pre-Selector						x							x							x							x							x							x							x						x							x		
SLN6396A High Gain Mixer							x							x							x							x							x							x							x						x							x
T-TXCO Oscillator								x	x	x	x	x	x	x															x	x	x	x	x	x	x														x	x	x	x	x	x	x								
X-HI-STAB Oscillator															x	x	x	x	x	x	x															x	x	x	x	x	x	x																								

R-1200A Service monitor, basic unit less plug-ins, supplied complete with front cover, antenna, AC line cord, DC connector, card extender, card extractor, instruction and service manual and standard master oscillator. Est. shpg. wt. 60 lbs. (24.30 kg.) Est. Packaged dim. 28 x 18 x 20 in. (71.12 x 45.72 x 50.80 cm.)

RTC-4000A Meter, deviation unit. Est. shpg. wt. 2½ lbs. (1.13 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

RTC-4001A Scope deviation unit. Est. shpg. wt. 4½ lbs. (2.03 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

SLN-6352A Wide-band FM unit. Est. shpg. wt 2 lbs. (.90 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

SLN-6396A High gain broadband FM mixer. Est. shpg. wt. 2 lbs. (.90 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

SLN-6353A 25-50 MHz FM pre-selector and wide-band input. Est. shpg. wt. 2½ lbs. (1.13 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

SLN-6354A 145-175 MHz FM pre-selector and wide-band input. Est. shpg. wt. 2½ lbs. (1.13 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

SLN-6355A 450-512 MHz FM pre-selector and wide-band input. Est. shpg. wt. 2½ lbs. (1.13 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

SLN-6369A 406-420 MHz FM pre-selector and wide-band input. Est. shpg. wt. 2½ lbs. (1.13 kg) Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

RTC-4018A AM/FM/SSB plug-in Receiver Module. Est. shpg. wt. 5 lbs. (2.27 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

SLN-6381A Audio frequency synthesizer. Est. shpg. wt. 2 lbs. (.9 kg). Est. packaged dim. 5½ x 5½ x 12½ in. (13.97 x 13.97 x 31.75 cm).

RPX-4016A Line Voltage Plug—100 VAC—Brown.

RPX-4017A Line Voltage Plug—115 VAC—White.

RPX-4018A Line Voltage Plug—125 VAC—Red.

RPX-4019A Line Voltage Plug—200 VAC—Orange.

RPX-4020A Line Voltage Plug—230 VAC—Yellow.

RPX-4021A Line Voltage Plug—250 VAC—Green.

28-82620C01 Convenient cigarette lighter connector (cable not supplied) for operating inverter from vehicle battery, negative groud only. Connector rated at 10 amps.

ST-1152 Instrument Cart.

SLN-6368A Deluxe Shipping/Carrying Case for S-1327. Est. shpg. wt. 24 lbs. (11 kg.) Est. packaged dim. 25 x 22 x 19 in. (635 x 559 x 483 mm.)

RTL-4010A Canvas Protective Cover for R-1200.

SLN-1011B 20 dB attenuator pad and cable.

R-1025A FREQUENCY COUNTER

The Model R-1025A, a 1 GHz counter, measures frequencies from 20 Hz to 1000 MHz. Low frequencies of 20 Hz to 100 MHz are applied to the A Input and 100 MHz to 1000 MHz inputs are applied to the B Input. The counter features an eight digit LED display. Front Panel controls are self-explanatory to provide visual readout of the frequency measured in kHz or MHz for A or B inputs respectively. An expanded frequency multiplier function, used in conjunction with the A input, permits low frequency measurements in Hz. Automatically positioned decimal point and leading zeros suppression provide error-free readings with resolutions to 0.1 Hz. When operating in the low frequency, multiplier measurement mode readout is in Hz with resolutions of 0.1, 0.01 and 0.001.

FEATURES

Frequency Range—Motorola's new R-1025A Frequency Counter measures frequency from 20 Hz to 1000 MHz.

Sensitivity—Sensitivity is 10 mVRMS over the entire frequency range.

Display & Resolution—8 digit LED Readout, 0.1 Hz resolution.

Tone Multiplier—Low frequency PL measurements are made with both high speed and high resolution with a built-in tone multiplier. The tone multiplier can be used from 50 Hz to 3000 Hz, yielding high speed readings with resolution to .01 Hz in one second.

Overload Protection—The 50 Ω or RF channel is overload protected. At an input level of 5 VRMS, a front panel replaceable fuse will open.

OPTIONAL

Internal Battery Pack—The battery's DC power is automatically implemented when AC power fails or is removed. The battery is continually being charged during AC power operation. When fully charged, the instrument will operate continually for approximately three hours.

MODEL NOMENCLATURE:

R-1025A	Frequency Counter.
R-1025A/220	Frequency Counter 220 V operation.
R-1025AN	Frequency Counter with Battery.
R-1025AN/220	Frequency Counter with Battery, 220 V operation.

SPECIFICATIONS

FREQUENCY MEASUREMENT

Frequency Range: 20 Hz to 1000 MHz. **A INPUT:** 20 Hz to 100 MHz direct. **B INPUT:** 100 MHz to 1000 MHz Prescaler. **A Input Direct—Range:** 20 Hz to 100 MHz. **Resolution:** 0.1 Hz to 1 kHz selectable, in decade steps. **Display:** Reads in kHz with automatically positioned decimal point. Leading zeros beyond the units decade are suppressed. **Accuracy:** ±1 count ±time base accuracy. **B Input Prescaler Range:** 100 MHz to 1000 MHz. **Prescale:** ÷16. **Resolution:** 0.1 Hz to 1 kHz selectable in dacade steps. **Display:** Reads in MHz with automatically positioned decimal point. Leading zeros beyond the units decade are suppressed. **Accuracy:** ±1 count ±time base accuracy.

INPUT CHARACTERISTICS

Input Impedance—A Input: 1 m /25 pF. **B Input:** 50 . **Sensitivity:** 10 mVRMS (both inputs). **Overload without Damage—A Input:** 500 V peak (DC plus AC component), 250 VRMS; 20 Hz to 10 kHz, 50 VRMS; 10 kHz to 2 MHz; 5 VRMS, 20 MHz to 100 MHz. **B Input:** 5 VRMS, fuse protected. **A Input Multiplier:** Provides high speed direct readings measurments (in Hz) of low frequency signals with resolution to 0.001 Hz. See Multiplier specifications. **Range:** 50 to 3000 Hz. **Multiplier:** x 100. **Resolution:** 0.001 Hz to 0.1 Hz selectable in decade steps. **Digit:** Reads in Hz with automatically positioned decimal point. Leading zeros beyond the units decade are suppressed. **Accuracy:** ±3 count ±time base accuracy.

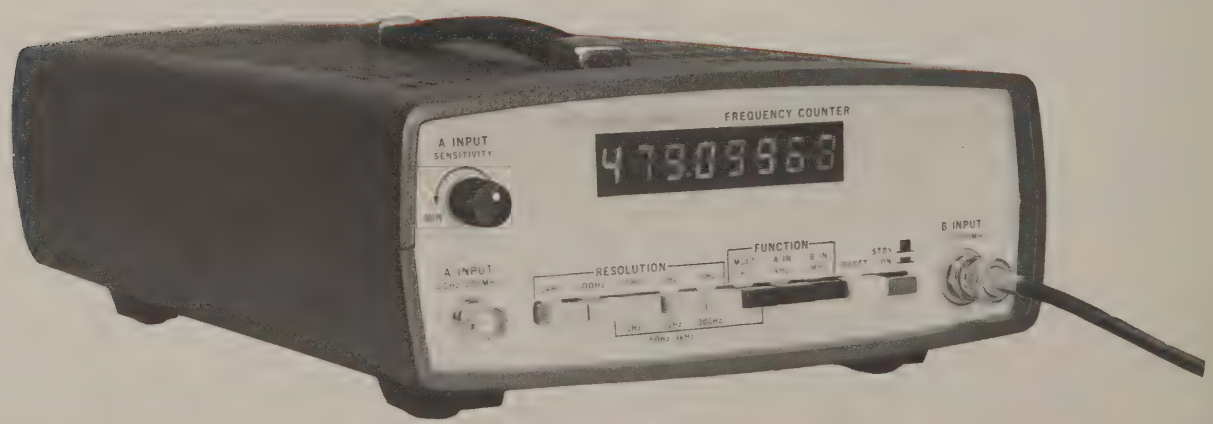
TIME BASE

Power Requirements—Voltage: +12 VDC to +15 VDC. **Current:** 15 mA maximum. **Aging Rate:** 1 x 10^{-8}/day. 3 x 10^{-7}/30 days. 1 x 10^{-6}/year. **Short Term Stability:** 5 x 10^{-10}/second. **Stability vs Power Supply:** 5 x 10^{-8} for 1% change in power supply voltage. **Frequency Adjustment:** Set to 10 MHz at 25°C range sufficient for 5 years aging settable to ±5 x 10^{-7}. **Temperature Variations:** ±5 x 10^{-7} from 0°C to +70°C. **Warm Up:** Frequency must be within 5 parts in 10^8 of its final frequency within 5 minutes. **Temperature Transients:** After a sudden change in temperature, the frequency must be within 5 parts in 10^8 of final frequency within 5 minutes. **External Input:** 1 MHz at 1 VRMS into 500 Ω switch selectable. **Time Base Output:** Clock Out (rear panel TTL 1 MHz output through 470 Ω).

GENERAL CHARACTERISTICS

Readout Display: 0.4" LED 8-digit in-line readout with decimal point. Automatic leading zero suppression. Off Scale indicator for overflow and a Gate indicator. **Display Storage:** Switch selectable, rear panel, display storage. Holds readings between samples. **Lamp Test:** Illuminates all segments of all digits.

R-1025A 20 Hz to 1000 MHz FREQUENCY COUNTER



R-1027A AUDIO COUNTER

FEATURES

- **High Resolution providing both input signal frequency and period measurement**
- **80 MHz frequency measurement**
- **Event counting to 1 billion and elapsed time measurement from 100 micro seconds to 100 hours**
- **Single function knob for easy operation**
- **Built-in self testing confidence test circuit**

MODEL NOMENCLATURE:

R-1027A	Audio Counter
R-1027A/240	Audio Counter 240 V Operation

GENERAL SPECIFICATIONS

Power Requirements: 105 V to 130 V or 210 V to 260 V (with internal transformer jumpers) 50/60 Hz. **Power Cord:** Detachable 3-wire. **Handle:** Variable position and tilt stand. **Case:** Molded, tan high impact thermoplastic case plus handle, 10″ wide (over handle) x 3¾″ high x 9¼″ deep. **Front Panel Controls:** Single rotary FUNCTION switch. Miniature toggle switches for POWER and ATTENuator functions. Push button RESET switch. **Lead Assemblies:** Input lead—coax cable, BNC connector one end, alligator clips other end. Rear panel accessory lead—molex miniature nylon connector which mates with rear panel connector; other end stripped and tinned. **Trigger Error:** Typically ±0.5% of measured value divided by the number of periods averaged below 1 MHz. **Weight:** 4½ lbs.

SPECIFICATIONS

INPUT CHARACTERISTICS

Impedance: 1M Ω shunted by 20 pF. **Connector:** Front panel BNC. **Coupling:** AC. **Sinewave Sensitivity:** 30 mVRMS. (5 Hz to 40 MHz), 50 mV max, at 80 MHz. **Maximum Input:** 200 V (peak AC + DC) DC to 500 Hz, derate linearily to 100 V at 1 kHz. 100 V (peak AC + DC) 1 kHz to 5 MHz, derate linearily to 30 V (peak AC + DC) at 80 MHz. **Attenuator:** X1 or X10 switch selectable.

FREQUENCY

Range: 5 Hz to 80 MHz. **Accuracy:** ± time base accuracy ±1 count ± trigger error. **Resolution:** 1 ppm or 1 Hz dependent upon function. **Input:** Front panel BNC connector. **Auto Gate Time:** 100 mS to 1 S automatically; selected depending on frequency, displaying six most significant digits with automatically positioned decimal point. **Manual Gate Time:** 1 S displaying six least significant digits with no decimal points. **Display Update:** 200 mS to 1.1 S dependent upon input frequency.

PERIOD

Range: 12.5 nS to 200 mS (5 Hz to 80 MHz). **Accuracy:** ± time base accuracy ± 1 LSD ± trigger error. **Resolution:** To 1 ppm. **Input:** Front panel BNC connector. **Diplay:** Six most significant digits with automatically positioned decimal point and units of measurement annunciated automatically on front panel. **Display Update:** 200 mS to 1.1S dependent upon the input signal. **No Input Display:** With no signal a dashed line is drawn across display.

TOTALIZE (EVENTS)

Range: 5 Hz to 80 MHz repetition rate. **Capacity:** 0 to 999.999 Mega events (999,999,999 events.) **Control:** Front panel manual RESET to 0, rear panel jack provision for remote reset. **Display:** Up to one million events; count is displayed as whole number with leading zero blanking. Over one million events; count is displayed as a six digit number, indicating six most significant digits, with "M" annunciator on indicating multiplier of one million. Over one billion events; overflow is indicated by a dashed line across display. **External Gate:** Rear panel connector with TTL or contact closure compatibility (i.e., open circuit starts events counting and closed circuit stops counting.)

TIMER

Range: 100 μS to 100 hr. (99:59:59). **Accuracy:** ± time base accuracy ± trigger error ± 1 count. **Control:** Front panel manual RESET to 0, rear panel jack provision for remote reset. **Display:** Indicates six most significant digits of elapsed time in hours: minutes: seconds and fractions of seconds in a floating format. Overflow indicated by dashed line across display. **External Gate:** Rear panel connector with TTL or contact closure compatibility (i.e., open circuit starts events counting and closed circuit stops counting).

TIME BASE
(Internal referenced to 25°C)

Type: Crystal Oscillator. **Frequency:** 10 MHz. **Setability:** ±.1 ppm (±Hz). **Line Voltage Stability:** Less than ±1 ppm for ±10% line voltage variation. **Maximum Aging Rate:** ± 10 ppm/yr. (±1 ppm/mo.). **External Input:** TTL level 50 Ω, 2.5 V PP, switch selectable from rear panel, BNC jack. **Temperature Stability:** Less than ±0.001% (i.e., ±10 ppm).

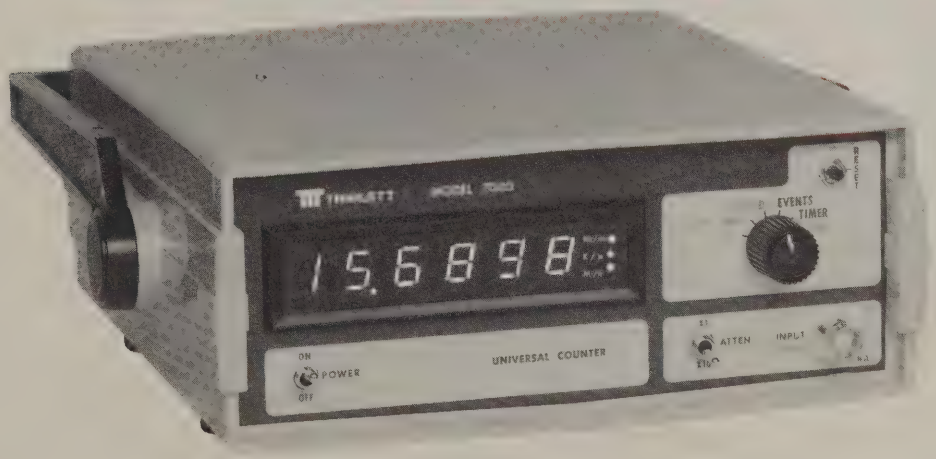
DISPLAY CHARACTERISTICS

Visual Display: Six digits (high efficiency LED type) .430 high with decimal points and colons. Also three annunciators as follows: Hz/ms, K/μ, M/n.

TEST CHARACTERISTICS

This function exercises the electronics of the unit to verify correct operation of internal electronics. The test first exercises the display and then performs internal tests.

R-1027A 5 Hz to 80 MHz AUDIO COUNTER



R-1201A SERIES SIGNAL GENERATOR

FEATURES

- **Fully Shielded Synthesizer**—The signal generator does not generate RF spray and is unaffected by ambient RF. Usefulness in the service environment is increased and the integrity of the attenuator setting is further insured.
- **"Clean" Output Signal**—Spurious signals are at least 40 dB below the desired output at all amplitudes below 110 MHz and this improves to 50 dB down above 110 MHz. Harmonics are at least 25 dB below the fundamental. Purity is not degraded when reducing the amplitude of the desired signal.
- **High Level Output At All Frequencies**—A full 1 VRMS is available (into a matched 50 Ohm load) from below 10 kHz to 999.9999 MHz. The output is leveled. Attenuation is accurate.
- **AM, FM, and CW Output**—Either internal or external modulation, or both, is selected by a convenient front panel switch.
- **Electronic Overload Protection**—Prevents damage to the synthesizer if an RF transmitter is inadvertently connected to the output. A front panel pushbutton provides convenient reset. This eliminates external pads or the need for fuses.
- **Digital Capability**—Both the frequency and amplitude modulators are DC coupled. All recent digital signalling systems may be serviced.
- **Improved Physical Packaging**—Removal of two panels allows access to all internal parts.
- **Multiple Tap Power Transformer**—A simple internal jumper plug allows quick selection of the following AC line voltages: 100, 115, 125, 200, 230, 250.

SUPERB PERFORMANCE

The R-1201A Series signal generator provides superb state-of-the-art performance. Convenient speed-lever frequency entry provides continuous frequency coverage from 100 Hz to 999.9999 MHz, all on fundamentals. Its advanced design provides the ability to set the synthesizer to 100 Hz increments (4 decimal places) providing direct "dial-up" of the latest 470-512 MHz splinter/tertiary channels. For example, frequencies such as 154.4675 MHz in the special industrial band and 165.0875 MHz in the military band can be set up exactly. *Frequency lock-up is almost instantaneous.* No need to wait for frequencies to stabilize before use. Pushbuttons provide speed and simplicity of operation. The push of a button selects CW, FM or AM generation. Outputs include a single variable RF output, and a variable level precision 1000 Hz signal for modulating a transmitter while setting deviation. IF signals can be generated at the same RF output connector. The 1 volt high level RF out lets you get through detuned circuits for fast, efficient receiver servicing.

With the R-1201A you can simultaneously modulate the signal generated with an internal 1000 Hz and an external "Private-Line" (PL) tone or "Digital Private-Line" (DPL) code. The ability to observe the deviation on a digital display is especially significant.

R-1201A SERIES SIGNAL GENERATOR

MODEL NOMENCLATURE

R-1201A	Signal Generator with Standard Oscillator
R-1201AT	Signal Generator with TCXO Oscillator
R-1201AX	Signal Generator with High Stability Oscillator
RTK-4005A	RF Test Cable, N to UHF type connector, 30″ long
RTK-4004A	RF Test Cable, N to BNC type connector, 30″ long

LINE VOLTAGE KITS

On your order, please specify line voltage required. Voltages may be altered in the field with the appropriate code plug transformer strapping kit (Order separately).

100 V—**RPX-4116A**
115 V—**RPX-4117A**
125 V—**RPX-4118A**
200 V—**RPX-4119A**
230 V—**RPX-4120A**
250 V—**RPX-4121A**

SPECIFICATIONS

Operating Modes: AM, FM, CW

FREQUENCY

Range: 100 Hz to 999.9999 MHz. **Display:** 7 digits individually selectable, rapid lever type. **Resolution:** 100 Hz. **Accuracy:** Equal to accuracy of reference oscillator.

RF Output
(Levelled into 50 Ohms)

Range: 0.1 μV to 1 VRMS −127 dBm to +13 dBm.

Flatness*: (@ 0.5 μV and 25°C)
100 kHz—250 MHz:
Typical ±0.5 dB
Maximum ±1 dB

250 MHz—550 MHz:
Typical ±0.7 dB
Maximum ±1½ dB

550 MHz—1000 MHz:
Typical ±1 dB
Maximum ±2 dB

Accuracy:**
100 kHz—550 MHz:
0 dB, Uncalibrated
Steps 20, 40, 60, 80 dB, ±1 dB
100, 120 dB, ±1½ dB

550 MHz—1000 MHz:
0 dB, Uncalibrated
Steps 20, 40, 60, 80 dB, ±1½ dB
100, 120 dB, ±2 dB

TEMPERATURE VARIANCE:

±0.5 dB additional over 0-55°C

*Variance of output as a function of frequency at fixed output setting.

**Additional one-time inaccuracy when switching from range to range.

SPECTRAL PURITY:

Harmonics: ≤ −25 dBc. **Non-Harmonic Spurious:** 100 kHz-110 MHz: ≤ −40 dBc. 110 MHz-1000 MHz: ≤ −50 dBc. **Noise:** Residual FM (.1 to 3 kHz BW): 100 kHz-500 MHz: ≤50 Hz RMS. 500 MHz-1000 MHz: ≤100 Hz RMS. **Residual AM:** (.1 to 3 kHz BW): ≤.1% at +13 dBm. 1 Hz BW noise at 50 kHz offset: 100 kHz-500 MHz: ≤ −103 dBc. 500 MHz-1000 MHz: ≤ −97 dBc. **Attenuator:** 20 dB variable, 20 dB steps over 6 ranges. **Output Impedance:** 50 Ohms, nominal. **Output Connector:** Type N.

AMPLITUDE MODULATION:

Range: 0 to 90% at output setting of +7 dB on vernier attenuator. **Rate:** 0 to 10 kHz. **Internal Rate:** 1 kHz fixed. **Pulse Response:** ≤ 40 μS rise and fall. **Indicator Accuracy:** ±3% of reading ±3% of full scale. **Resolution:** .1% Distortion (@ 1 kHz rate): at 30% modulation: .6% typical, 1.2% max. at 70% modulation: .5% typical, 2.5% max. at 90% modulation: 1% typical, 5% max. **External Input:** 2 V peak for 100%, BNC Connector. **Impedance:** 600 Ohms. **Incidental FM:** (at 30% AM, 1 kHz rate): ≤90 Hz. **Modes:** Internal, external or both simultaneously.

FREQUENCY MODULATION:

Internal Rate: 1 kHz fixed. **Deviation:** 0 to 20 kHz peak. **Rate:** DC to 15 kHz. **Pulse Response:** ≤ 40 μS rise and fall. **Indicator Accuracy:** ±3% of reading, ±100 Hz. **Resolution:** 10 Hz. **External Input:** 2 V peak for 20 kHz peak deviation, BNC connector. **Impedance:** 600 Ohms. **Distortion:** at 20 kHz deviation, 1 kHz: ≤ 1.2% at 20 kHz deviation, 15 kHz rate: ≤2.6% at 10 kHz deviation, 15 kHz rate: ≤1%. **Incidental AM:** (at 20 kHz deviation, 1 kHz rate): ≤1%. **Modes:** Internal, external or both simultaneously.

TIME BASE ACCURACY:

Standard: Not recommended for 200 to 250 VAC operation) 1×10^{-7} from −10° to +55°C; 1×10^{-6} per year aging; 30 min. warm-up. **TCXO:** 1×10^{-8} from 0° to +55°C; 1×10^{-8} per year aging; no warm-up required. **High Stability:** 1×10^{-8} from −15° to 60°C; 1×10^{-9} per year aging; 15 min. warm-up.

TIME BASE OPTIONS:

Standard Oscillator: This is an ovenized time base which has a warmup time of approximately 30 minutes. It provides 1×10^{-7} (.1 ppm) stability over the −10°C to +55°C temperature range. THIS TIME BASE IS NOT RECOMMENDED FOR 200 TO 250 VAC OPERATION. A field modification can be performed for operation at 200 to 250 VAC but it removes standby power from the crystal oven when the unit is turned off. **TXCO Oscillator:** This is a temperature compensated, non-ovenized time base which provides 1×10^{-6} (1 ppm) stability over the 0° to +55°C temperature range. **High Stability Oscillator:** This is an ovenized time base which has a 15 minute warmup time with a stability of 1×10^{-8} (.01 ppm) over the temperature range of −15°C to +66°C.

Aging Characteristics of all of the above is 1×10^{-6} (1 ppm) accumulative over one year. It is an exponential characteristic with the rate of change decreasing after the first three months.

GENERAL

Time Base Input: 1, 5 and 10 MHz. **Internal 1 kHz Output:** Level: 0 to 2 V peak. **Distortion:** ≤1%. **Connector:** BNC. **Output Protector:** Trip Approx. 10 V peak ±DC and AC to 1000 MHz. **Reset:** Pushbutton. **RF Leakage:** AT level not to increase IF output test point of a Motorola A04FNC pager (0.2 μV sensitivity) by more than ½ dB when placed 12 inches (30.5 cm) in front of unit developing 0.5 μV output into a shielded termination. **Power:** 100, 115, 125, 200, 230, 250 VAC, 50-60 Hz, 75 watt max., plug programmable. **Indicators:** Modulation Lock—Frequency Leveled—RF Output Mode—AM, FM, CW. **Temperature:** Operating: −12° to +55°C (10° to 131°F). **Storage:** −55°C to +85°C (−67° to 185°F). **Weight:** 40 lbs. (18.2 kg) net; 52 lbs. (23.6 kg) shipping. **Dimensions:** 16-¾″ wide, 18-¾″ deep, 5¼″ high (42.6 cm wide, 46.6 cm deep, 13.3 cm high).

R-1020A SIGNAL GENERATOR

FEATURES

- **Low RF Leakage or Spray**—The signal generator meets an extremely rigid spray specification. Special RF leakage and spray reduction circuitry is incorporated into the generator at no extral cost. This insures no detectable spray when servicing the most sensitive paging receivers.
- **Accurate**—Although the frequency accuracy indicated by the front panel lamp is ±0.001% of the frequency setting, this accuracy includes long term drift, short term drift during warm up, incidental FM, and variations due to power line and temperature changes.

  The typical accuracy after a two hour warm up is much improved, in the order of ±0.0002% of frequency setting. Once the frequency is calibrated to this accuracy (after a two hour warm up at 25 °C), the ±0.0002% accuracy can be achieved for time periods up to three months.
- **IF Capability**—This generator will provide IF test frequencies as low as 450 kHz which eliminates the need for a separate box or optional add-on to generate these needed frequencies.
- **Electronic Overload Protection**—Prevents damage to the Signal Generator if an RF (transmitter) is keyed into it or a DC source is inadvertently connected to the output. This eliminates the need for external pads or changing fuses.

R-1020A SIGNAL GENERATOR

Especially designed for ease of setting receiver frequency, the low frequency drift and multiple features makes the R-1020A Signal Generator ideal for two-way radio servicing. No cluttered front panels with range switches, modulation meters, and level set controls.

The calibrated output is leveled to within ±0.75 dB across the frequency range of 1 MHz to 520 MHz. The "Unleveled" indicator will illuminate if the output level accuracy falls outside the specifications of the unit. Exceptionally fast turn-on. When the front panel "Accuracy" lamp stops flashing (usually within 5 seconds), you are phase-locked to the reference crystal. No need for a counter.* No need to range switch. Simply dial in the desired frequency to a resolution of 1 kHz. The "Accuracy" lamp indicates the unit's specification.

The unit features both internal and external amplitude and frequency modulation capabilities. Internal AM and FM modulation frequencies to 400 Hz and 1 kHz are available. In the AM mode of operation, amplitude modulation to 90% is attainable. In the FM mode of operation, peak deviations up to 50 kHz are attainable.

The slide control potentiometer allows precise settings of AM percent modulation or FM frequency deviation in accordance with the corresponding "Modulation Mode/Freq" switch positions. This feature eliminates the need for an additional meter on the front panel. The modulation control and readout are one and the same. This same potentiometer also can serve as a manual amplitude frequency control when the "Modulation Freq" switch is in the "DC" position. When the "Mode" switch is in the "AM" position, the slide potentiometer can provide up to a +6 dB increase in output amplitude. With the "Mode" switch in either of the FM positions, the slide potentiometer provides up to a 5 kHz or 50 kHz increase in frequency to the CW signal indicated on the lever/indicator switches.

The FREQUENCY VERNIER control provides the user with the ability to fine tune the dialed-in frequency ±5 kHz. When the unit is taken out of the CAL position, the VERNIER ACCURACY lamp illuminates indicating that the accuracy is other than ±0.001%.

MODULATION FLEXIBILITY

The standard frequency deviation ranges (5 kHz and 50 kHz peak) were chosen to satisfy the majority of FM test applications in the communication fields. A 1.0 volt RMS signal into the external modulation input connector calibrates the deviation control for 5 kHz or 50 kHz full scale, depending on selection of either the FM x 1 or FM x 10 mode. If increased resolution is desired over any other specific range, select the FM x 1 mode and simply

R-1020A SIGNAL GENERATOR

decrease the input voltage level of the external modulation signal by a factor of 10. For example, if a particular test calls for approximately 300 Hz deviation, you can calibrate the front panel for 400 Hz full scale by selecting the FM x 1 mode and reducing the external modulation input signal to 0.1 VRMS. With this same input level, the FM x 10 mode is now calibrated for 5 kHz full scale. This is an ideal feature for use on tone coded radio receivers.

MODULAR CONSTRUCTION

In addition to the shielding benefits it offers, the modular approach also greatly enhances the servicing and maintainability of the instrument. Trouble-shooting is simplified through the use of built-in-test indication techniques. If the output RF signal loses phase-lock, the front panel "Accuracy" lamp will flash. Several of the modules contain LED indicators. By removing the unit's top cover and looking for the module with an illuminated LED, you can quickly identify the portion of the over-all instrument circuit that is malfunctioning.

All modules are field replaceable.

In some applications of radio servicing a frequency counter may be required. Such as: Base stations with high stability oscillators or paging receivers which require the IF frequency to be counted in order to set the receiver on frequency.

MODEL NOMENCLATURE

R-1020A	Signal Generator, 115 VAC.
R-1020A/230V	Signal Generator, 230 VAC.
RTK-4005A	RF Test Cable; N to UHF Type Connector, 30" long.
RTK-4004A	RF Test Cable, N to BNC Type Connector, 30" long.

SPECIFICATIONS

FREQUENCY:

Range: 450 kHz to 520 MHz selectable in 1 kHz steps. (450 kHz to 1.0 MHz range has degradation of leveling harmonic, residual FM & AM specs.). **Readout:** 6 digit level/indicator switches. **Resolution:** 1 kHz. **Accuracy:** Typically ±0.0002% after 2 hours; ±0.001% after 5 minutes all modes (±0.001% ±10 kHz when "Frequency Vernier" is not in "Cal" pos.). **Stability:** 0.2 ppm/hr all modes (500 Hz per 10 minutes when "Frequency Vernier" is not in "Cal" pos.).

RF OUTPUT:

Power Level Range: +13 dBm to −137 dBm (1 V to 0.02 μV/RMS). **Level Control:** Continuously adjustable in 10 dB steps and with an 11 dB vernier. Output level is indicated on a front panel meter calibrated in volts and dBm. **Total Level Accuracy:** +13 to −7 dBm, ±1.25 dB, −7 to −77 dBm, ±1.95 dB; −77 to −137, ±2.75 dB. **Accuracy Breakdown:** Flatness (+13 to −7 dBm) ±0.75 dB; Output Meter: ±0.5 dB; Step Attenuator ±0.5 dB to 70 dB (±0.2 dB calibration error) ±1.0 dB to 130 dB (±0.5 dB calibrator error). **Impedance:** 50 Ohm (SWR <1.2 at RF output levels below 0.1 V). **Leakage:** Easily meets MIL-1-618D and also much more stringent spec as follows: RF leakage or radiated spray shall be at such a low level as not to cause the level at the IF test point of a sensitive paging receiver (Motorola A04FNC with .2 μV sensitivity) to change more than 0.5 dB at a 12" distance.

SPECTRAL PURITY:

Harmonic Output: >30 dB below fundamental from 10 to 520 MHz; > 20 dB below fundamental from 1 to MHz. **Sub-Harmonics:** Non detectable.

NON-HARMONICS:

Fundamental	Spurious Level
1 to 3 MHz	≥60 dB in 1 to 3 MHz band
3 to 250 MHz	≥65 dB in 3 to 250 MHz band
3 to 350 MHz	≥55 dB in 3 to 350 MHz band
3 to 520 MHz	≥35 dB in 3 to 1000 MHz band

Residual AM: ≥55 dB below carrier in a 50 Hz to 15 kHz post-detection bandwidth. **Residual FM:** ≤200 Hz in a 50 Hz to 15 kHz post-detection bandwidth. Typically ≤100 Hz. (450 kHz to 1.0 MHz range has degradation of harmonic, residual FM & AM specs.)

AMPLITUDE MODULATION:

Note: AM Specs applicable for carrier level ≤±3 dBm. AM is possible above +3 dBm, if peak output does not exceed +13 dBm. **Frequency:** Internal: 400 Hz and 1 kHz ±3%; **External:** DC to 20 kHz (3 dB bandwidth). A 1.0 VRMS signal into 600 Ohm is required to provide calibrated % modulation control. **Range:** 0-90%. **Distortion:** 3% to 70% AM (5% to 90% AM) at a frequency of 1 kHz. **Modulation Control:** Calibrated from 0 to 100%. **Accuracy:** ±(5% + 5% of reading) at a frequency of 1 kHz.

FREQUENCY MODULATION

Internal: 400 Hz and 1 kHz ±3%; **External:** A 1.0 VRMS signal into 600 Ohm is required to provide calibrated deviation control. 50 Hz to 25 kHz (±1 dB bandwidth). DC "Cal" pos. **Peak Deviation:** Two bands, 0 to 5 kHz and 0 to 50 kHz. **Deviation Control:** Calibrated from 0 to 5 kHz, x 1 and x 10. **Accuracy:** ±250 Hz on x 1 range; ±3500 Hz on x 10 range. **Distortion:** 4% (3 to 50 kHz deviation) at a frequency of 1 kHz.

OPERATING TEMPERATURE:

25°C ±5°C all specifications apply; 25°C ±15°C slight degradation of specs. Note: Generator may not operate above 45°C or below 5°C.

REVERSE POWER PROTECTION:

RF Input is protected against damage from accidental RF power Inputs to 110W.

MECHANICAL:

Output Connector: Type N. **Dimensions;** 12 in./30.3 cm wide; 5¼ in./13.4 cm high; 13-¾ in./34.9 cm deep. **Weight:** 28.6 lbs./13 kg net; 30 lbs./13.6 kg shipping. **Power:** 115/230 V ±10%; 50/60 Hz; 40 VA. **Order:** R-1020A/230 V for 230 VAC line operation.

R-1013A SINAD METER

The R-1013A SINAD Meter is a specialized distortion meter for 12-dB SINAD receiver sensitivity measurements. Just connect the meter to the audio output, adjust the FM Signal input (from a Motorola R-1201A Series Signal Generator) for a 12 dB reading on the SINAD Meter and read sensitivity directly from the Signal Generator. It's simple! No frequency or null controls to set, no level adjustments and no switching back and forth between reference and distortion functions.

Unlike transmitter power output, receiver sensitivity frequently does not get sufficient attention when servicing two-way radios. For example, a 60-watt transmitter that only delivered 50 watts would probably cause more concern than a .35 microvolt receiver that only measured .5 microvolt sensitivity. The difference in transmitter power is only .8 dB while the difference in receiver sensitivity is equivalent to 3 dB. A 3 dB system degradation is the same as halving transmitter output power. Thus it is very important that receiver sensitivity be measured and maintained for optimum system performance.

Unfortunately, one of the most common methods of measuring receiver sensitivity, the 20-dB quieting method, only measures the ability of the receiver to receive a CW signal and not the ability to receive and deliver a modulated signal. In fact, the 20-dB quieting method can be misleading in many cases where the receiver is aligned for a peaked response. The 20-dB quieting method may give a very good sensitivity measurement in such a case even though the receiver is not aligned for best reception of a *modulated signal.*

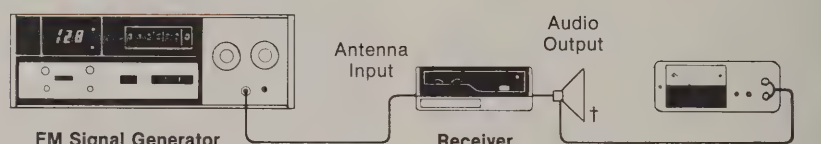
The better method for measuring sensitivity is the 12-dB SINAD (Signal plus Noise And Distortion) method. This measurement is made with a modulated signal, and includes noise and distortion, more closely approximating actual operating conditions than the 20-dB quieting method. The primary reason for the popularity of the 20-dB quieting method, over the 12-dB SINAD method, is that prior to the introduction of the Automatic SINAD Meter, the SINAD method was more time consuming and required an expensive general purpose distortion meter. Now, however, with the use of the Motorola R-1013A SINAD Meter, 12-dB SINAD measurements can be made quickly and accurately and alignment adjustments can be optimized for improved receiver performance.

R-1013A	SINAD Meter, 115 VAC
R-1013A/230 V	SINAD Meter, 230 VAC
SKN-6001A	Test Cable, dual banana plug with Alligator Clips (order separately).

SPECIFICATIONS

Input Level: 40 mV to 10 VRMS. **Input Impedance:** 100k Ohm in parallel with 50 pf. **Accuracy:** ±1 dB. **Notch Filter:** 1 kHz ±5 Hz (note preset audio oscillators must be within this range for accurate measurements). **Power:** 115/230 VAC, ±20%, 50/60 Hz strap selectable. 13.8 VDC, ±20%. On/Off Switch with LED indicator. **Size:** 7″ x 7-$^{3}/_{16}$″ x 2-¾, **Weight:** 2-¾ lbs. (1¼ kg). **Temperature Range:** 0° to +45°C (operating) −10°C to +55°C, with accuracy degradation to ±2 dB. **Accessory:** SKN-6001A test cable, dual banana plug with alligator clips.

Easy to Use!



FM Signal Generator set at ±3 kHz Peak Deviation; 1 kHz, ±5 Hz, Modulating frequency.) (Motorola R-1201A shown)

Receiver

Motorola R-1013A SINAD Meter

1. Set Signal Generator on channel frequency, modulate with 1 kHz audio tone (±5 Hz), and set peak modulation deviation to ±3 kHz.
2. Insert strong signal into receiver and set volume control to comfortable level.*
3. Decrease Signal Generator level until SINAD Meter reads 12 dB.
4. Read 12-dB SINAD sensitivity from Signal Generator attenuator.

* This is a suitable, simplified, procedure for servicing and production line testing. To obtain SINAD sensitivity exactly to EIA specifications (RS-204-A), volume should be set at rated audio output.

† Note when connecting the SINAD meter to the speaker jack of a radio, care must be taken to properly terminate the radio in its appropriate speaker impedance.

R-1013A SINAD METER

AUDIO OSCILLATOR, DEVIATION CALIBRATOR, TONE OSCILLATORS

S-1067B AUDIO OSCILLATOR

A. Motorola's S-1067B Audio Oscillator is the outstanding answer to the need for a laboratory-quality, compact, lightweight instrument necessary in both shop and field checking of base stations and remote control consoles, setting levels and compensating phone lines.

In addition to serving as a general-purpose audio oscillator, the unit is particularly ideal for maintaining tone-operated systems.

The S-1067B frequency response is typically ±0.3 dB and rated at ±1 dB maximum into 150 Ohms or more and represents the small amount of output change that is present as the dial is swept through a range.

S-1067B	Solid State Audio Oscillator complete with battery and 117 VAC power cable. Est. shpg. wt. 9 lbs. (4.05 kg). Est. packaged dim. 8½ x 8¾ x 14¼ in. (21.59 x 22.23 x 36.20 cm).

ACCESSORIES

SKN-6001A	Test Leads Cable Kit with dual banana plug and alligator clips. Est. shpg. wt. 1 oz. (28 gr).
SKN-6010A	117 VAC power cable.
SKN-6009A	220 VAC Power Cable. Est. shpg. wt. 8 oz. (224 gr). Est. packaged dim. 5-¾ x 3 x 2 (14.61 x 7.62 x 5.08 cm).
SLN-6214A	Matching Transformer provides 10 VRMS into 10KΩ load. Est. shpg. wt. 2 oz. (56 gr). Est. packaged dim. 3½ x 2½ x 2½ in. (8.89 x 6.35 x 6.35 cm).
SLN-6225A	Matching Transformer for 600 Ohm line. Est. shpg. wt. 2 oz. (56 gr).
60-82457B01	Spare battery, 22½ V dry cell.

SPECIFICATIONS

Frequency Range: 20 Hz—200 kHz, in 4 overlapping ranges. **Dial Accuracy:** ±5%. **Frequency Response:** ±1 dB into 150 Ohms or more (resistive load). **Output Voltage:** 1.5 VRMS ±1 dB into 150 Ohms; 1.0 VRMS (min.) into 50 Ohms. **Source Impedance:** Less than 50 Ohms at any output voltage level. **Distortion:** Less than 1%*. **Transistor Complement:** One silicon field effect transistor and six silicon transistors. **Battery Life & Type**:** 100 hours. 600 Ohms or higher loads with 1 Burgess type 4156 (22½ V) dry cell or equiv. Part No. 60-82457B01. **AC Input Requirements:** 105-130 VAC 50 Hz-400 Hz at 6 ma approx. can be operated with 230 VDC, 50-400 Hz by using SKN-6009A 230/117 VAC adaptor cable kit (optional). **Filter (1 kHz Distortion Analyzer) Characteristics:** Frequency accuracy = ±5%. 1 kHz rejection = more than 50 dB; input resistance = 600 Ohms (approx.). **Operating Temperature:** 0° to ±50°C (32°F to 122°F). **Dimensions:** 10¼ x 6½ x 5-¾0 (approx.). **Weight:** 7-¾ pounds.

* 50 Hz to 200 kHz with 150 Ohms or higher load at 1.5 VRMS max., or 50 Ohms at 1 VRMS max.

**Based on discharge time of 4 hours per day at room temperature.

R-1009 DEVIATION CALIBRATOR

B. The R-1009 Deviation Calibrator provides a convenient and accurate method of checking the baseband calibration of microwave point-to-point receivers. It does this by means of a switchable crystal controlled oscillators which can be set to the IF center frequency, high or low peak deviation at the IF frequency or switched at an audio rate between high and low peak deviation.

The mixer plug-in is for use in systems that have a 10.7 MHz IF amplifier frequency and a transmitter with a 35 MHz test output frequency. A RTC-4002A 10.7 MHz Deviation Calibrator plug-in must be used in conjunction with the mixer to calibrate the IF baseband output. The mixer provides a 10.7 MHz output so that the transmitter deviation can be adjusted by looping the 35 MHz transmitter test output through the mixer into a calibrated 10.7 MHz IF amplifier.

The mainframe is shipped with two blank panels and will accept up to three plug-in modules from the list below.

R-1009A	Deviation Calibration.

SPECIFICATIONS

Output: −30 dBm (nominal). **Battery Drain:** 12 mA. **Battery Life:** 48 hours (with 60-82728J01). **Temperature Range:** −10°C to +60°C.

Tone Oscillators

Battery operated oscillators with two frequencies (400 and 1000 Hz) for use in adjusting transmitter deviation, setting tone levels on remote control lines and testing audio circuits. Provides one volt minimum when used to modulate transmitter audio circuits of 500 Ohms or higher.

MODELS AVAILABLE

C. TEK-1B Tone Oscillator—TEK-1B supplied with a 3-foot cord terminated in a 4-prong microphone connector.

TEK-1B	Tone Oscillator w/cable and battery. Est. shpg. wt.: 2 lbs. (.90 kg). Est. packaged dim.: 9 x 4½ x 4½ in. (22.86 x 11.43 x 11.43 cm).

D. TEK-28A Tone Oscillator—Designed for panel mounting in either the Motorola S-1056-59C Mobile test set or the RTC-100A Universal Panel. Supplied with 3-foot cord terminated in 4-prong microphone connector.

TEK-28A	Est. shpg. wt. 1½ lbs. (.68 kg). Est. package dim. 6 x 14-¾ x 4 in. (15.24 x 37.47 x 10.16 cm).

R-1009A Deviation Calibrator List of Plug In Modules

MODEL NO.	DESCRIPTION	MICROWAVE SYSTEM
R-1009A	Mainframe	-
RTC-4002A	10.7 MHz IF (70 kHz RMS Deviation)	MR100
RTC-4003A	35.0 MHz IF (400 kHz RMS Deviation)	MR100, Starpoint
RTC-4004A	70 MHz IF (2.1 MHz RMS Deviation)	MR200, MR30 MR600, MR300
RTC-4005A	Mixer (35 MHz & 10.7 MHz)	MR100

Batteries not supplied, order Motorola Part Number 60-82728J01.

A

S-1067B AUDIO OSCILLATOR

B

R-1009 DEVIATION CALIBRATOR

C

TEK-1B TONE OSCILLATOR

D

TEK-28A TONE OSCILLATOR

R-1100A CODE SYNTHESIZER

Motorola R-1100A Code Synthesizer is a microprocessor controlled service instrument that generates a number of two-tone sequential codes with stored timing intervals as well as a number of other selective signalling codes for servicing the following systems:

- **Tone Only Paging*.**
- **Tone and Voice Paging*.**
- **Tone Only With Battery Saver Paging.***
- **Group Call Paging*.**
- **Quick Call II Signalling.**
- **Single Tone Burst.**
- **Private Line.**
- **Continuous Tone.**
- **Coded Squelch Systems.**
- **Digital Private Line.**
- **Coded Squelch Systems.**
- **IMTS** telephone dial encoding and 2805 Hz RCC interrupt dialing.**
- **Tone Remote Base Signalling.**

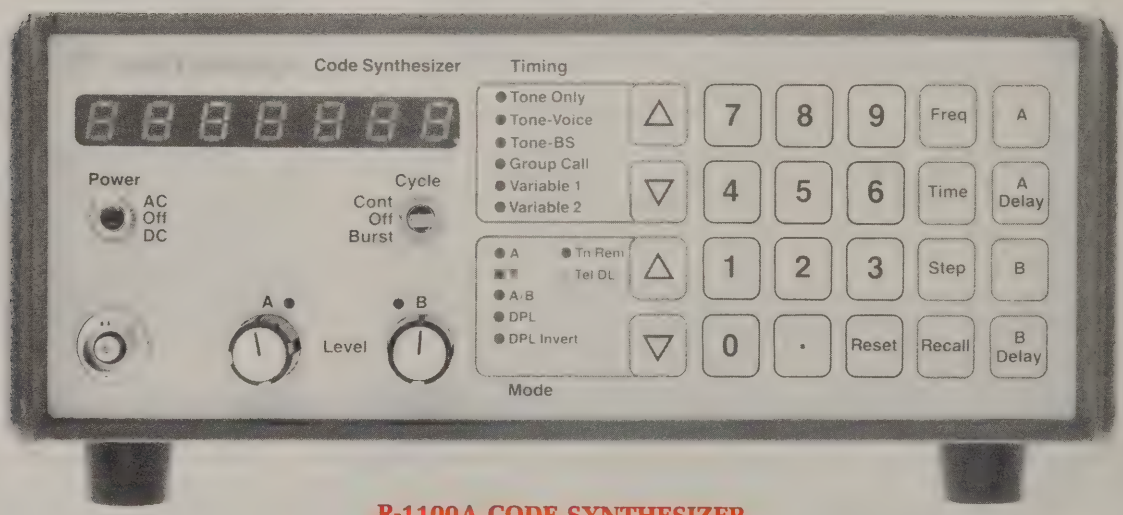
In addition, the unit can also be used as a 10 Hz to 9.999 kHz general purpose audio oscillator.

The correct time intervals and sequence for all standard Motorola two-tone sequential paging systems, as well as other signalling systems, are stored within the unit. You need only select the desired mode and insert the correct frequencies or other codes. The unit also has provision for temporarily storing the time intervals for up to two additional sequences for other types of two-tone sequential systems. All stored frequencies and time intervals may be recalled and displayed at will. Telephone numbers and DIGITAL PRIVATE-LINE squelch codes are also displayed on the LED readout.

In addition to providing a wide variety of selective signalling codes, with the Motorola Code Synthesizer you can also step through a frequency range in small increments to check circuit band pass, telephone line characteristics, filter tolerance, or center frequency or simply use the unit as a high quality, low distortion audio oscillator. Two units can be slaved to provide simultaneous tone coding.

The Motorola Code Synthesizer is human engineered to provide a logical front panel layout and to minimize the number of controls required. Bail allows unit to be tilted for ease of viewing on work bench and rugged metal case and optional battery pack provide the ultimate in versatility for shop or field use.

*Standard Motorola paging systems.
**Improved mobile telephone system.



R-1100A CODE SYNTHESIZER

MODEL NOMENCLATURE

R-1100A	Code Synthesizer, 110 VAC or 12 VDC.
R-1100AN	Code Synthesizer with battery option, 110 VAC.
R-1100A/220 V	Code Synthesizer, 220 VAC or 12 VDC.
R-1100AN/220 V	Code Synthesizer with battery option, 220 VAC.
RTL-4052A	Carrying case. Consists of one 15-80336A85 case and one 42-80336A86 shoulder strap.
RTL-4053A	600 Ohm line matching transformer only. 58-80336A27 adaptor required.
RTL-1003A	600 Ohm line matching transformer with 58-80336A27 adaptor.
RTP-1003A	Separate battery pack for field add on.
9-80334A25	Replacement DC plug for 12 VDC operation.
28-80334A22	Strobe plug for slaving units together. One required for each unit.

SPECIFICATIONS

MODES:

General audio sinewave oscillator (continuous or burst-single cycle). Single tone. Two-tone sequential. (Timing): (pre-programmed stored intervals and sequence) tone only paging* tone and voice paging* tone only with battery saver paging* group call paging* Read/write (volatile) storage for programming two additional time sequences.

DIGITAL PRIVATE-LINE squelch (and invert).

IMTS** telephone dial encoding and 2805 Hz RCC interrupt dialing. Tone remote base signalling.

FREQUENCY:

Range: 10 Hz to 9999 Hz. **Resolution:** ±1 digit. **Distortion:** 2% (3% on DC). **Accuracy (temp):** 0.01%.

TIME INTERVAL:

Range: 0 sec. to 999.9 sec. **Resolution:** ±1 digit. **Accuracy (temp.):** .005 sec. **Output Amplitude:** 0-3 V RMS, adjustable. **Operating temp.:** 0° – 50°C. **Power:** 110/220 VAC, 50/60 Hz via internal power transformer tap or 12 VDC. Optional rechargeable battery and built-in charger available. **Operating time on fully charged battery:** 5 hours at room temp. of 25°C. Battery may be recharged to over 95% of capacity in 12 hours also at 25°C. **Weight:** Approx. 6 lbs. (2.72 kgm) less optional battery and built-in charger. Add 4 lbs. (1.8 kgm) for battery option. **Size:** 4½" x 9" x 10-⅜" (11.4 cm x 22.9 cm x 26.4 cm) including handle and feet. **Standard EIA tests:** RS152B shock and two times RS152B vibration. Same as Motorola mobile radios.

*Standard Motorola Paging System

**Improved mobile telephone system

MICROPROCESSOR AND ASSOCIATED SOFTWARE

The use of microprocessor technology allows time intervals to be permanently stored within the unit as well as allowing other non standard data to be temporarily stored and recalled at will. Built-in logic precludes the entry of invalid codes. This state-of-the-art technology also allows more features to be economically included in a compact unit, simplifies operation, and provides high reliability by reducing the number of individual components required as compared with discrete component circuitry.

MEMBRANE KEYBOARD INPUT

A custom designed membrane keyboard panel for mode selection and data input provides high reliability and resistance to wear and simplifies the user interface. Audible feedback when key is pressed provides positive indication of each key stroke.

LED DIGITAL READOUT

Light emitting diodes provide a high reliability display of data during input as well as data recalled from storage. The unit provides for four digit readout of frequency or time intervals, full DIGITAL PRIVATE-LINE squelch codes, and seven digit readout of telephone numbers.

RFI PROTECTION

Circuits are designed to minimize and shield against radio frequency interference (RFI) for reliable operation in the two-way radio servicing environment.

SYNTHESIZER TONE GENERATION

Synthesizer provides highly stable audio tones accurate to 0.01%. This provides positive assurance that frequency sensitive components in a system are accurately tested to specified tolerances. Frequency range is 10 Hz to 9.999 kHz with four-digit resolution and time intervals are adjustable from 0 sec. to 999.9 sec. to a resolution of one millisecond (0.001 sec.).

CHOICE OF OPERATING VOLTAGES

Operates from 110 VAC or 220 VAC 50/60 Hz (via internal power transformer tap) to allow unit to be used with either type of supply voltage without cumbersome external transformers. Unit also operates directly from 12 VDC vehicular power source allowing it to be used in a service vehicle at remote locations away from the shop.

INTERNAL BATTERY OPTION

Internal battery option allows unit to be used anywhere for extreme servicing flexibility and convenience. Built-in charger operates from 110/220 VAC, 50/60 Hz. Unit will operate up to five hours on a fully charged battery and may be recharged overnight.

R-1028A SINGLE TRACE OSCILLOSCOPE

FEATURES

- **Compact and Portable**
- **Bandwidth DC to 10 MHz**
- **Built-in Component Tester**
- **Stable Triggering up to 30 MHz**

The Motorola R-1028A Oscilloscope is a portable, lightweight, single trace oscilloscope designed to meet many of the requirements of the two-way service technician. The oscilloscope is equipped with a convenient carrying handle and tilt stand. Front panel controls and inputs are clearly identified and arranged so that after a short period of time the technician will find the instrument easy to use.

The R-1028A will accept all signals in the range from DC to at least 10 MHz.

The Component Tester allows for checking discrete components in circuit. For trouble-shooting of complex circuits, it is possible to locate faults by comparison with known good devices.

The trigger and sweep circuit of the R-1028A uses a technique that allows stable triggering up to 30 MHz.

The vertical amplifier of the instrument is provided with a diode protected FET input. The vertical sensitivity is determined by the 12-step frequency compensated input attenuator.

MODEL NOMENCLATURE

R-1028A	Single Trace Oscilloscope
R-1028A/220	Single Trace Oscilloscope—220 V

ACCESSORIES

RTL-4011A	x1 Probe Kit
RTL-4012A	x10 Probe Kit
RTL-4013A	x1, x10 Switchable Probe Kit

SPECIFICATIONS

VERTICAL DEFLECTION (Y-AXIS)

Bandwidth: DC to 10 MHz (−3dB), DC to 15 MHz (−6dB). **Risetime:** Approximately 35 ns. **Overshoot:** Maximum 1%. **Deflection coefficients:** 12 calibr. steps, 5 mV/cm to 20 V/cm in 1-2-5 sequence, accuracy better than ±5%. **Input impedance:** 1 MΩ in parallel with 25 pF. **Input coupling:** DC-AC-GD. **Input Voltage:** Maximum 500 V (DC + peak AC).

TIMEBASE

Time Coefficients: 18 calibrated steps, 0.5 μs/cm to 0.2 s/cm in 1-2-5 sequence, with variable control uncalibr. to 0.2 μs/cm, accuracy better than ±5% (in cal. position). Normal length of baseline: approximately 7 cm.

TRIGGER SYSTEM

Source: Internal or external. **Slope:** Positive or negative. **Modes:** Manual Trigger level control, Automatic Triggering (AT). **Sensitivity:** 3 mm (2 Hz to 30 MHz). **External:** 0.5-5 V, AC only.

HORIZONTAL DEFLECTION (X-AXIS)

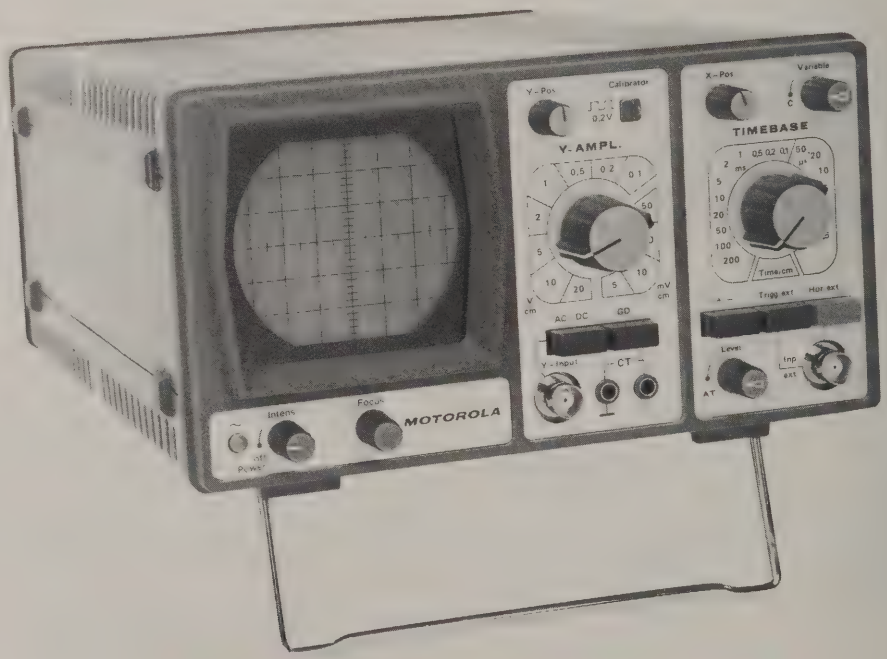
Bandwidth: 1 Hz to 1 MHz (−3 dB). **Deflection coefficient:** Approximatley 0.75 V/cm. **Input impedance:** Approximatelty 1 MΩ/25 pF.

COMPONENT TESTER

Test voltage: Maximum 8.6 VRMS (open circuit). **Test current:** Maximum 28 mA RMS (shorted). **Test frequency:** 50 or 60 Hz. Test circuit grounded to chassis.

GENERAL INFORMATION

Cathode-ray tube: 7 cm. dia. (3 inch dia.) **Accelerating potential:** Approximately 1 kV. **Built-in calibrator:** Built-in square-wave generator 1 kHz for probe alignment (0.2 ± 1%). **Power:** 110, 127, 220, 237 VAC ±10% (50/60 Hz), approximately 24 W. **Weight:** 8.1 lbs. (3.7 kg). **Dimensions:** H 4.5″ (114 mm), W 8.3″ (212 mm), D 10.6″ (270 mm).



R-1028A SINGLE TRACE OSCILLOSCOPE

635.00

R-1029A DUAL TRACE OSCILLOSCOPE

FEATURES

- **Bandwidth DC to 20 MHz**
- **Triggering up to 30 MHz**
- **Large CRT Display**
- **Dual Trace Operation**

The Motorola R-1029A is a general purpose dual trace oscilloscope with DC to 20 MHz bandwidth. The oscilloscope is equipped with a carrying handle and convenient tilt stand. The instrument has stable sweep triggering (to 30 MHz) with measuring accuracy to ± 3 percent.

The oscilloscope can be used for single or dual trace operation. Two signals can be displayed either consecutively (alternate mode) or by multiple switching of the channels within one sweep period (chop mode).

The triggering technique achieved through a monolithic integrated voltage comparator allows very small signal amplitudes to be reliably triggered.

The R-1029A has two pre-amplifiers with diode protected FET inputs. The pre-amplifier input stages are monolithic integrated circuits to minimize drift.

MODEL NOMENCLATURE

R-1029A	Dual Trace Oscilloscope
R-1029A/220	Dual Trace Oscilloscope—220 V

ACCESSORIES

RTL-4011A	x1 Probe Kit
RTL-4012A	x10 Probe Kit
RTL-4013A	x1, x10 Switchable Probe Kit

SPECIFICATIONS

VERTICAL DEFLECTION (Y-AXIS)

Bandwidth of both channels DC-20 MHz (– 3 dB), DC-28 MHz (– 6 dB). Risetime: 17.5 ns (approx.). Overshoot: 1% (maximum). **Deflection coefficients:** 12 calibr. steps, 5 mV/cm-20 V/cm (1-2-5 sequence), accuracy better than ± 3%. **Input impedance:** 1 MΩ in parallel with 25 pF. **Input coupling:** DC-AC-GND. **Input voltage:** max. 500 V (DC + peak AC). **Operating modes:** Channel 1, Channel II, Channel I and II, alternate or chopped (approx. 120 kHz). X-Y operation: sensitivity ratio 1:1.

TIMEBASE

Time coefficients: 18 calibrated steps, 0.5 μs/cm to 0.25/cm (1-2-5 sequence), with variable control uncalibr. to 200 ns/cm, with magnifier x5 uncalibr. to 40 ns/cm, accuracy better than ± 3% (in cal. position). **Ramp output:** 5 V (approx.).

TRIGGER SYSTEM

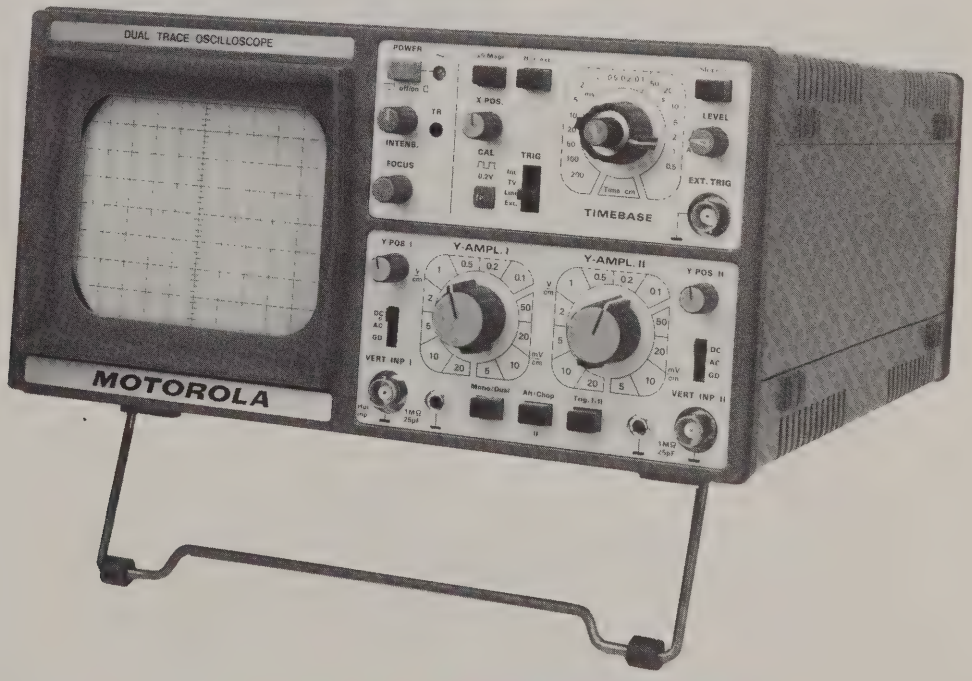
Modes: automatic or variable trigger level. **Sources:** Channel I, Ch. II, line, external. **Slope:** positive or negative. Coupling: AC or TV-low-pass-filter. **Sensitivity:** int. 3 mm, ext. 0.7 V (approx.). **Bandwidth:** 30 Hz (auto), 5 Hz (level) up to at least 30 MHz.

HORIZONTAL DEFLECTION (X-AXIS)

Bandwidth: DC-2 MHz (– 3 dB). Input: via Channel I, for other data see Y deflection spec. X-Y phase difference: <3° up to 100 kHz.

MISCELLANEOUS

Cathode-ray tube: 13 cm dia. (5 inch dia.) **Accelerating potential:** 2 KV. **Calibrator:** square-wave generator 1 kHz, 0.2 V ± 1%, for probe compensation. **Trace rotation:** adjustable at front panel. **Power:** 110, 125, 220, 240 VAC, ± 10%, (50/60 Hz), approximately 36 Watts. **Weight:** 13.2 lbs. (6 kg). **Dimensions:** H 5.7″ (145 mm), W 11.2″ (285 mm), D 15″ (380 mm).



R-1029A DUAL TRACE OSCILLOSCOPE

S-1350C WATTMETER

WATTMETER

The S-1350C Wattmeter is a precision instrument that measures forward and reflected RF power. This sturdy, compact meter is designed for plug-in, in-line elements. To operate, clip the meter over the bi-directional element to read forward or reverse power. The elements may be left in antenna or transmission lines, eliminating the need to go off-the-air when measuring power.

Rugged, sealed elements provide long, trouble-free life. The RF cavity and sense line is an integral part of the element, eliminating variations in accuracy, VSWR (voltage standing wave ratio), and losses in the measurement system throughout the life of the element.

Durable cases provide a convenient means for carrying and storing meter and elements. The meter case contains compartments for up to three elements. The accessory case holds up to 12 additional elements.

MODEL NOMENCLATURE

S-1350C	Wattmeter
ST-1198	Meter Carrying Case
ST-1199	Element Carrying Case
58-82273C01	Male "N" to Female "UHF" Adaptor
58-83150D01	Male "UHF" to Female "N" Adaptor
58-855270	Male "UHF" to Female "BNC" adaptor
58-84300A98	Male "N" to Female "BNC" Adaptor

SPECIFICATIONS

S-1350C WATTMETER

Metering Method: Insertion type RF wattmeter. Indicates forward or reverse power by switch operation. **Emissions Measured:** CW or FM carrier. AM or TV at zero modulation only. **Frequency Range:** 2 MHz to 1 GHz with appropriate elements. **Power Measurement Ranges:** 2.5 watts to 2500 watts full scale with appropriate elements. **Accuracy:** ±5% full scale. **Impedance:** 50 Ohms. **VSWR:** 1.2:1. **Minimum Directivity:** 20 dB. **Dimensions:** Meter: 4″ x 4¼″ x 3¼″ including feet, less element. **Element:** 1″ x 1¼″ x 5¼″ including connectors. **Weight:** Meter: 21 oz. **Elements:** 10 oz.

S-1350C WATTMETER

WATTMETER ELEMENTS

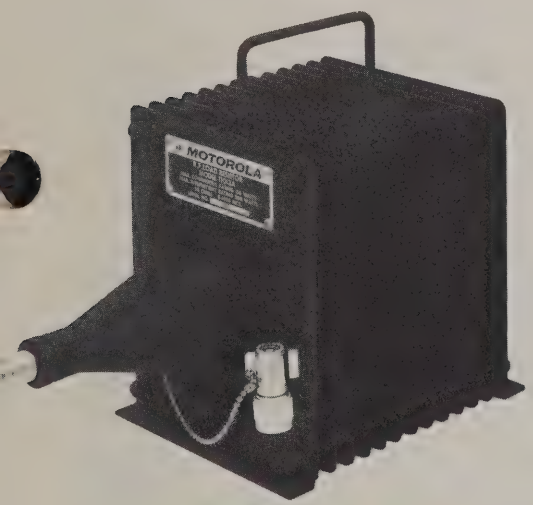
T-1013A RF LOAD RESISTOR

This unit provides the answer to the 2-way radio serviceman's need for a lightweight RF dummy load with an extensive range. The T-1013A will handle 300 watts of RF at 15-minute intervals or 150 watts continuous power. The continuous power rating can be extended to 225 watts, if sufficient air is kept moving past the cooling fins.

T-1013A RF Load Resistor. Est. shpg. wt. 8½ lbs. (3.83 kg). Est. packaged dim. 20 x 7½ x 9 in. (50.80 x 19.05 x 22.86 cm).

SPECIFICATIONS

T-1013A RF Load Resistor. **Impedance:** 50.0 Ohms. **Standing Wave Ratio:** 1.2 or less. **Frequency Range:** 0-1000 MHz (usable to 3000 MHz). **Connectors:** "N" type. "UHF" type adaptor provided. **Size:** 6 x 7-⅛ x 12-⅝ inches.



T-1013A RF LOAD RESISTOR

WATTMETER ELEMENTS

Frequency (MHz)	Maximum Power (Watts)	"N" Type Connector Model	"UHF" Type Connector Model
2-30	250	—	ST-1296
2-30	2500**	—	ST-1299
25-60	5	ST-1280B	ST-1281B
25-60	10	ST-1285B	ST-1284B
50-125	5	ST-1283B	ST-1282B
50-125	10	ST-1286B	ST-1287B
25-100	25	ST-1204B	ST-1244B
25-100	50	ST-1205B	ST-1245B
25-100	100	ST-1206B	ST-1246B
25-100	250	ST-1207B	ST-1247B
25-100	500	ST-1208B	ST-1248B
100-250	5	ST-1212B	ST-1252B
100-250	10	ST-1213B	ST-1253B
100-250	25	ST-1214B	ST-1254B
100-250	50	ST-1215B	ST-1255B
100-250	100	ST-1216B	ST-1256B
100-250	250	ST-1217B	ST-1257B
100-250	500	ST-1218B	ST-1258B
200-250	2.5	ST-1221B	ST-1261B
200-550	5	ST-1222B	ST-1262B
200-550	10	ST-1223B	ST-1263B
200-550	25	ST-1224B	ST-1264B
200-550	50	ST-1225B	ST-1265B
200-550	100	ST-1226B	ST-1266B
200-550	250	ST-1227B	ST-1267B
200-550	500	ST-1228B	ST-1268B
500-1000	2.5	ST-1231B*	ST-1271B
500-1000	5	ST-1232B*	ST-1272B
500-1000	10	ST-1233B*	ST-1273B
500-1000	25	ST-1234B*	ST-1274B
500-1000	50	ST-1235B*	ST-1275B
500-1000	100	ST-1236B*	ST-1276B
500-1000	250	ST-1237B*	ST-1277B
500-1000	500	ST-1238B*	ST-1278B

*The N type connector is recommended for best accuracy in the 500-1000 MHz frequency range.
**Calibrated at 1000 W, but usable to 2500 W.

S-1339A AND S-1340A RF MILLIVOLTMETERS

FEATURES

- **Measures RF voltages from 100 μV to 3 V.**
- **Accurate measurements over the frequency range of 10 kHz to 1.2 GHz, usable to 8 GHz.**
- **Analog or Digital Display**
- **High Impedance Probe or 50 Ohm Termination.**

WIDE FREQUENCY RANGE

The calibrated frequency-range of all versions extends from a low 10 kHz to 1.2 GHz with uncalibrated response to beyond 8 GHz. Relative accuracy above 1.2 GHz is typically ±0.5 dB

A 50 Ohm terminated BNC adaptor is supplied as standard for 50 Ohm voltage measurements up to 600 MHz.

MEASUREMENTS FROM MICROVOLTS TO 3 VOLTS

Eight ranges from 1 mV full scale to 3 V full scale are arranged in 1-3-10 sequence. No attenuator attachments are required for measurements up to 3 V.

TRUE RMS RESPONSE

All models provide true RMS response for signal inputs below approximately 30 mV.

S-1339A AND S-1340A RF MILLIVOLTMETERS

LOW NOISE

Extensive care is taken throughout the design and construction to hold noise from all sources to a minimum.

MODEL NOMENCLATURE

S-1339A	Analog RF millivoltmeter. Est. shpg. wt. 10 lbs. (4.6 kg.)
S-1340A	Digital RF millivoltmeter. Est. shpg. wt. 11.5 lbs. (5.2 kg.)
RTL-4040A	High voltage probe.
RTL-4000A	N Tee adaptor for use above 600 MHz.
RTL-4001A	50 Ohm termination for use above 600 MHz
(A)1-83554F64	RF Probe with cable and connector.
(B)1-83554F66	50 Ohm BNC adapter.
(C)1-83554F65	Probe tip with grounding clip lead.

The Model S-1339A Analog and S-1340A Digital RF Millivoltmeters provide highly accurate voltage measurements of very low RF levels at FM two-way radio communications frequencies. These instruments greatly facilitate the servicing of sophisticated solid-state communications equipment, as in making stage gain measurements, and are essential in metering the test points in the Motorola Pageboy II Radio Pager where a 1 millivolt range is required.

High reliability, long intervals between calibrations, plug-in PC boards for ease of servicing, lightweight, little heat and no warm-up delay are characteristics of the solid state design. Instruments are programmable with linear DC output. The RF probe is supplied with a probe tip and a terminated 50 Ohm BNC adapter as standard equipment.

The large mirrored-scale panel-meter on the S-1339A analog unit has linear 0-3 and 0-10 voltage scales finely divided for precise readings. A dBm scale referred to 1 mW in 50 Ohm is standard. Range push buttons are marked in mV and dBm to correspond with the meter scales.

The S-1340A digital model has a 4-digit display, blanked for 5% over range and below 20% full scale, with full scale counts of 3,000 and 1,000. It employs LED's (light emitting diodes) for bright easy-to-read characters.

An unusual feature allows the zero to be quickly and easily adjusted using the vertical edge-meter to the right of the display. The meter is calibrated in dBm (1 mW in 50 Ohm) and is essential for peaking and nulling.

SPECIFICATIONS

ANALOG READOUT (MODEL S-1339A)

Voltage Range: 100 μV to 3 V. **Full Scale:** *Voltage Ranges:* 1, 3, 10, 30, 100, 1,000 and 3,000 mV. *dBm Range:* −60 to +23 dBm. **Frequency Range:** 10 kHz to 600 MHz (with Standard Probe) 600 MHz to 1.2 GHz (with tee adapter and 50 Ohm Termination) uncalibrated response to approx. 8 GHz. **Accuracy:** ± (1% rdg. + 1% f.s.). **VSWR:** Less than 1.5 to 1.2 GHz (Return Loss greater than 23 dB). **Power Sensitivity:** 200 pW, minimum detectable power in 50 Ω. **RFI:** There is no detectable radiated or conducted leakage from instrument or probe. **Meter:** 4½ inch taut band, response time <1s for fs: *Two linear voltage scales:* 0 to 3; 0.05 per division, 0 to 10; 0.1 per division, *One logarithmic dBm scale:* −10 to +3; 0.2 per division max. **Temperature:** In accordance with ANSI (ASA) Spec. 39.7 0 error from ref. 21°C. to 25°C **Response Time:** Full scale input step function response time: less than 100 ms at DC output on 30 mV fs to 3 V fs ranges increasing to 1 s. on the 1 mV fs range. **Power:** 115 or 230 V ± 10%, 50 to 400 Hz, 8 W. **Dimensions:** 5.2″ H (without (feet), 8.3″ W (½ module) 11.7″ D (132 x 211 x 293 mm). **Weight:** Net 7.5 lbs. (3.4 kg) (with standard accessories). **Accessories Furnished:** RF Probe, Probe Tip, 50 Ω BNC Adapter.

DIGITAL READOUT (MODEL S-1340A)

Voltage Range: 200 μV to 3 V. **Display:** LED, 4 digits, full scale counts of 3,000 and 1,000. Display blanked for 5% overrange and below 20% fs. Vertically-mounted edgemeter is calibrated in dBm, 50 Ω, with accuracy not specified. **Display period:** 200 ms. **Encode period:** 75 ms. **Power:** 115 or 230 V 10%, 50 to 400 Hz, 10 W. **Weight:** Net 9 lbs. (4.1 kg) (with standard accessories). All other specifications are the same as Model S-1339A.

S-1053C AC VOLTMETER

FEATURES

- **All Silicon Transistors.**
- **High Input impedance.**
- **High Sensitivity.**
- **Light-weight and Portable.**
- **Battery and Line Operated.**
- **Amplifier Output.**

S-1053C AC VOLTMETER

Measures from 100 microvolts to 300 volts RMS on 12 scale ranges. Provides dB measurements from −72 to +52 on 12 ranges. Amplifier output provides 1.4 volts peak to peak, or 0.5 volts RMS into 600 Ohms or more. Taut-band indicating meter incorporates a linear scale for more accurate readings between scale markings; excellent repeatability without meter tapping and increased electrical ruggedness for greater overload protection. For field use, the Motorola AC Voltmeter is supplied with a protective front cover. Clips inside cover permit convenient storage of cable kit.

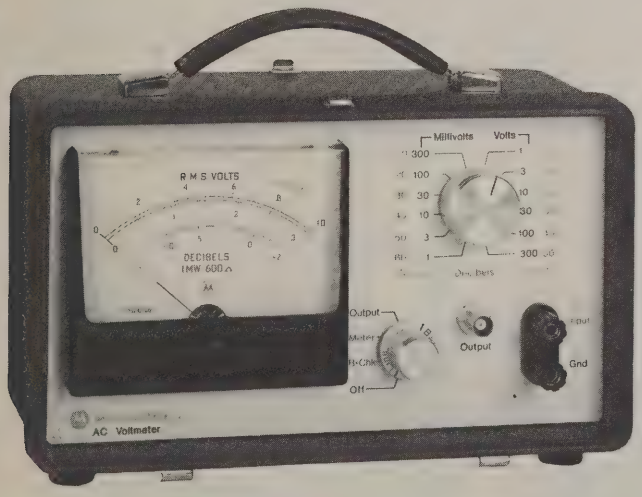
Unit may be operated from either battery power or any convenient AC source. This flexibility means that the unit operates from an AC source while in the service shop, laboratory or on the production line. Since the batteries are not in use during such applications, battery life is greatly extended. Batteries last longer, retain reserve power for portable applications and where freedom from power line interference is desirable. Even in the laboratory, its battery operation offers many advantages. The Motorola AC voltmeter can be used without a transformer when making measurements on ungrounded or symmetrical circuits. And there is no problem of hum or noise interference pick-up from AC power lines.

MODEL NOMENCLATURE

S-1053C	AC Voltmeter with Battery and 117 V ac Power Cable. Est. shpg. wt. 8¼ lbs. (3.71 kg). Est. packaged dim. 8½ x 8¾ x14¼ in. (21.59 x 22.23 x 36.20 cm).
SKN-6001A	Test Lead Cable Kit with dual banana plug and alligator clips. Est. shpg. wt. 1 oz. (28 gr).
60-82292H01	Spare battery, 8.4 V mercury.
SKN-6008A	117 V ac power cable.
SKN-6009A	220 V ac power cable. Est. shpg. wt. 8 oz. (224 gr). Est. packaged dim. 5¾ x 3 x 2 in. (14.61 x 7.62 x 5.08 cm).

SPECIFICATIONS

Accuracy: Within ±2% of full scale between 20 Hz and 1 MHz; ±1 dB of full scale between 5 Hz and 2.5 MHz. **Voltage Range:** 1 mV to 300 volts RMS in 12 ranges (1, 3, 10, 30, 100, 300 millivolts and 1, 3, 10, 30, 100 and 300 volts full scale) plus dB scale range of −72 dB to +52 dB, referred to 1 milliwatt in 600 Ohms. **Detachable Cover:** Stores conveniently on back of unit. **Input Impedance:** 10 megohms shunted by 15 mmf on the 1 to 300 volt ranges; 1 megohm shunted by 30 mmf on the 1 to 300 millivolt ranges. **Overload Protection:** Protected up to 550 volts peak in "volt" ranges: up to 110 volts (AC) in "Millivolt" ranges. **Operating Temperature Range:** −20°C to +50°C. At +10°C and +40°C accuracy changes less than 2% within frequency range of 20 Hz to 1 MHz. **Circuit:** Fully transistorized with 7 transistors. **Batteries:** One 8.4 V mercury battery. Part No. 60-82292H01. **Normal Battery Life:** Over 400 hours. **Finish:** Dark gray metallic wrinkle finish with brushed aluminum front panel.



S-1053C AC VOLTMETER

R-1002A DIGITAL VOM

The R-1002 is a lightweight portable 3½ digit VOM with unique analog output and indication. The instrument can be operated either from AC line or a self-contained battery making it ideal for both bench or field use. The instrument has an easy-to-read non-blinking LED display. Exclusive MOS-LSI circuitry assures high stability and reliability, immunity to noise, low power drain, and permits compact design. The analog meter is useful for nulling and peaking. The instrument measures 29 selected ranges . . . 5 AC and DC voltage and 5 AC and DC current and 6 resistance ranges.

MODEL NOMENCLATURE

R-1002A Digital VOM complete with test leads, 120 VAC line adaptor and instruction manual (less batteries.)

R-1002/220 V Digital VOM as above except has 220 V line AC adaptor.

ACCESSORIES

TEKA-87 Carrying case for R-1002A.
RTL-4009A RF probe.
RTL-4020A Replacement test leads.
60-82750K01 Replacement battery for R-1002A (4 required) Nickel-cadmium "C" size rechargeable.
RTL-4016A Replacement 120 VAC adaptor/charger.
RTL-4017A Replacement 220 VAC adaptor/charger.
RTK-4034A Deluxe test lead kit.

SPECIFICATIONS

Maximum Common Mode Voltage— 600 V (DC plus peak AC) from "COMMON" terminal to third wire power line ground terminal.

Display—Numerical Display: 3½ digits, 7-segment, 0.33 inch high LED type, non-blinking with storage. **Conversion Rate:** 3 readings per second nominal. **Overrange Indication:** Automatic beyond 1999, with lower half of the "1" digit flashing. **DC Polarity Selection:** Automatic, with "+" or "−" indication. **Analog Display:** 50-0-50 μA meter type.

Analog Output—Level: 1 VDC with reading of 1000. **Output Resistance:** 100 Ohms, nominal. **Accuracy:** ±(accuracy of range +2% of meter FS).

Reference Conditions— Temperature: +25°C ±1°C. **Relative Humidity:** 30 to 60%. **Atmospheric Pressure:** 575 to 800 mm Hg.

Power Requirements— AC Operation or Battery Charging: 120 VAC or 220 VAC ±10% (check rear panel designation) 50 to 400 Hz. **Battery Operation:** Four nickel-cadmium "C" size rechargeable cells (not supplied). Each cell rated at 1.25 V, 1.5 ampere-hours, order Motorola Part No. 60-82750K01 (4 required) separately. **Operation Time (continuous with fully charged battery:** 8 hours nominal. **Recharge Time (function switch in "BATT CHRG. ONLY" position):** 16 hours nominal. **Recharge Time (while instrument is in operation):** 30 hours nominal.

Temperature Range—Operating: 0°C to +50°C. **Storage:** −40°C to +60°C.

Weight (with batteries)— 4.5 lbs. (nominal); **(Without batteries):** 4.0 lbs. (nominal).

Dimensions—7.20 high 5.40 wide, 3.750 deep (not including panel controls.

DC VOLTAGE

RANGE	MAXIMUM INDICATION	INPUT IMPEDANCE	OVERLOAD PROTECTION
200 mV	199.9 mV	≥ 100 MΩ	350 V
2 V	1.999 V	≥1000 MΩ	350 V
20 V	19.99 V	10 MΩ	1100 V
200 V	199.9 V	10 MΩ	1100 V
1000 V	1110 (max. input)	10 MΩ	100 V

DC CURRENT

RANGE	MAXIMUM INDICATION	FULL SCALE VOLTAGE	DROP OVERLOAD PROTECTION
20 μA	19.99 μA	200 mV	3 mA
200 μA	199.9 μA	200 mV	25 mA
2 mA	1.999 mA	200 mV	½ Amp*
20 mA	19.99 mA	200 mV	½ Amp*
200 mA	199.9 mA	200 mV	½ Amp*
2A	1.999 A	200 mV	3 Amps
10 A	10.00 A (max. input)	100 mV	10 Amps

*Fuse Protected.

AC VOLTAGE

(Average-sensing, RMS-Calibration Sinewave)

RANGE	MAXIMUM INDICATION	INPUT IMPEDANCE	OVERLOAD PROTECTION
200 mV	199.9 mV	1 MΩ and 150 pf	350 VRMS
2 V	1.999 V	1 MΩ and 150 pf	350 VRMS
20 V	19.99 V	1 MΩ and 150 pf	650 VRMS
200 V	199.9 V	1 MΩ and 150 pf	650 VRMS
600 V	600 V (max. input)	1 MΩ and 150 pf	650 VRMS

AC CURRENT

(40Hz to 10 kHz)

RANGE	MAXIMUM INDICATION	FULL SCALE VOLTAGE	DROP OVERLOAD PROTECTION
200 μA	199.9 μA	200 mV	25 mA
2 mA	1.999 mA	200 mV	½ Amp*
20 mA	19.99 mA	200 mA	½ Amp*
200 mA	199.9 mA	200 mV	½ Amp*
2 A	1.999 A	200 mV	3 Amps
10 A	10.00 A (max. input)	100 mV	10 Amps

*Fuse Protected.

RESISTANCE

RANGE	TEST CURRENT	MAXIMUM INDICATION	FULL SCALE VOLTAGE	MAX. OPEN-CIRCUIT VOLTAGE	OVERLOAD PROTECTION
200 Ω*	199.9 Ω	420 μA	100 mV	150 mV	250 VRMS
2 kΩ*	1.999 kΩ	42 μA	100 mV	150 mV	250 VRMS
20 kΩ	19.99 kΩ	10 μA	200 mV	10 V	250 VRMS
200 kΩ	199.9 kΩ	10 μA	2 V	10 V	250 VRMS
2 MΩ	1.999 MΩ	1 μA	2 V	10 V	250 VRMS
20 MΩ	19.99 MΩ	100 nA	2 V	10 V	250 VRMS

***Low Power Ohms:** 1. Maximum Open Circuit Voltage = 150 mV; 2. Maximum Power Dissipated in Unknown = 100 μW.

Replacement 120 VAC adapter/charger— **RTL-4016A**

Replacement 220 VAC adapter/charger— **RTL-4017A**

R-1002A DIGITAL VOM

S-1063B DC MULTIMETER

The S-1063B is a lightweight, portable electronic DC multimeter with laboratory precision . . . highly versatile . . . ideally suited for radio communications servicing both in the shop and in the field. Durable, solid state circuitry plus a rugged, heavy-duty aluminum housing combine to form an extremely rugged and sturdy instrument. Taut-band meter with 4″ scale provides excellent repeatability, increased overload protection and greater linearity for improved accuracy. Control facilities include function selector, range switch, polarity reversal switch, zero set and Ohms-infinity adjustment. Battery operation means there is no 60 Hz hum problem, no common ground problem. Battery life is over 600 hours.

Excellent sensitivity, high input resistance and 3% voltage accuracy are but a few of the many features designed to meet a wide variety of applications.

S-1063B	DC Multimeter, Bat./117 VAC ±10%, 50-300 Hz. Complete with battery and 117 VAC power cable. Est. shpg. wt. 8¼ lbs. (3.71 kg). Est. packaged dim. 8½ x 8¾ x 14¼ in. (21.59 x 22.23 x 36.20 cm).
SKN-6008A	117 VAC power cable
SKN-6009A	220 VAC power cable. Est. shpg. wt. 8 oz. (224 gr). Est. packaged dim. 5¾ x 3 x 2 in. (14.61 x 7.62 x 5.08 cm).
SLN-6055A	Plug-in RF Probe. Est. shpg. wt. 4 oz. (112 gr).
SLN-6083A	Probe termination (50 Ohms). Est. shpg. wt. 3 oz. (84 gr).
60-82457B01	Spare battery, 22½ V
60-82458B01	Spare battery, 1½ V

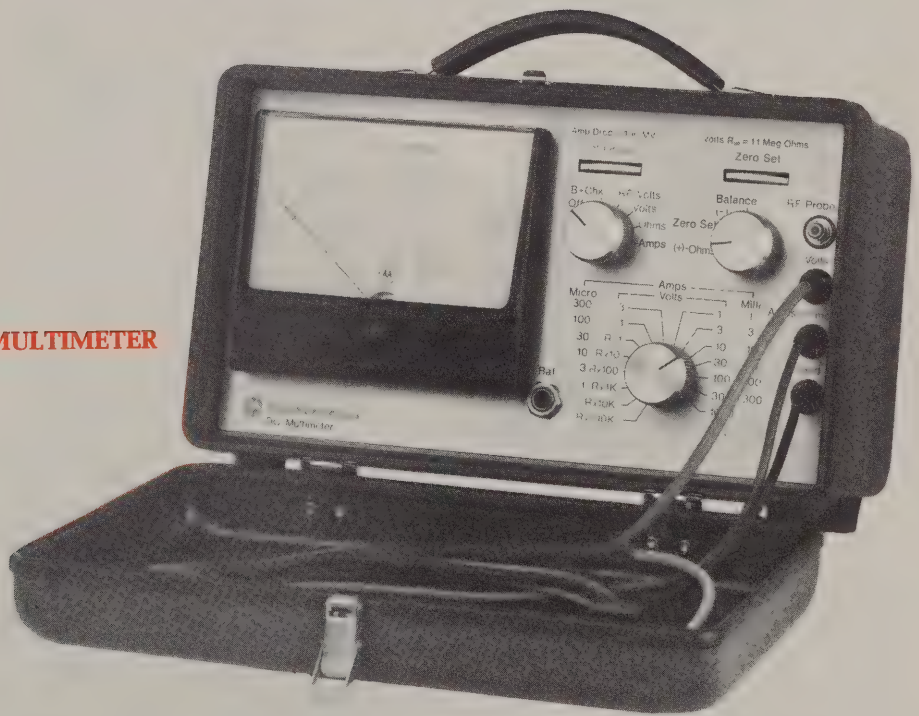
SPECIFICATIONS

S-1063B DC MULTIMETER

DC Voltmeter Ranges (full scale): Millivolts—100 and 300. Volts—1, 3, 10, 30, 100, 300, and 1000. **Accuracy:** ±3% of full scale. **Input resistance:** 11 megohms. (10 megohms on 100 mV range.) **Zero Drift:** less than 1%/°C. **DC Milliammeter Ranges (full scale):** microamperes—1, 3, 10, 30, 100 and 300. Milliamperes—1, 3, 10, 30, 100 and 300. **Accuracy:** ±5% of full scale. **Ohmmeter ranges (center scale):** Ohms—10, 100, 1000, 10,000, 100,000 and 1,000,000. Measurement range: 0.2 Ohms to 50 megohms. **Accuracy:** ±5% at center scale. **Circuit:** All silicon transistor circuit. **Batteries:** 1 Burgess type 4156 (22½ V) Pt. No. 60-82457B01. 1 Burgess Type 130 (1½ V). Pt. No. 60-82458B01. **Size:** 10¼″ x 6½″ x 5¾″.

SLN-6055A AND SLN-6083A RF PROBES

Frequency Response: ±1 dB of full scale, 10 kHz to 10 MHz; ±2 dB of full scale, 10 MHz to 200 MHz. **With termination:** ±1 dB of full scale, 100 MHz to 400 MHz. **Ranges:** 0.3, 1.0, 3.0 and 10.0 volts full scale.



S-1063B DC MULTIMETER

R-1001A DIGITAL MULTIMETER

R-1001A DIGITAL MULTIMETER

Completely Portable—No separate battery pack or power supply needed. Operates up to 8 hours on 4 nickel-cadmium, rechargeable "D" cell batteries. When plugged in to the AC line the batteries recharge automatically. No fear of blow-up or ruining of batteries.

Non-Blinking 3½ Digit Display—Instant readout, no warm-up time required. Numerals are formed by positive seven-segment build-up permitting more constant illumination. Automatic + or − and overrange indication.

28 Switch-Selected Ranges —5 AC and DC voltages . . . 5 AC and DC currents . . . and 5 resistances . . . with accuracy from ±0.5% of reading, ±1 digit.

The unit combines the advantages of high accuracy, multiple range testing with non-blinking digital numerical display. It is ideal for all-day field assignments or laboratory situations where line power is not available or where line interference is to be avoided.

RTL-4009A RF Probe—The RF Probe is designed to measure voltages at frequencies above the range of the regular test probe furnished with the R-1001A and R-1002A. The probe consists of a probe body, a 4 foot length of coaxial cable, a dual-banana connector, and a ground lead which screws into the probe body and is terminated with an alligator clip.

MODEL NOMENCLATURE

R-1001A	Digital multimeter complete with instructon manual (less batteries). Est. shpg. wt. 4½ lbs.
RTL-4009A	RF probe
RTL-4020A	Replacement test leads.
60-82750K02	Replacement battery for R-1001A (4 required). Nickel cadmium "D" size rechargeable.

SPECIFICATIONS

R-1001A DIGITAL MULTIMETER

Accuracy % or reading: +15°C to 35°C. **DC Voltage:** ±(0.1% of reading +1 digit). **AC Voltage:** ±(0.5% of reading +2 digits) 40 Hz – kHZ; ±(1.0% of reading +2 digits). **DC Current:** ±(0.5% of reading +1 digit), except ±(1.0% of reading +1 digit) on 2000 mA and 10 A ranges. **AC Current:** ±(1.5% of reading +2 digits), ±(2.0% of reading +2 digits) on 2000 mA and 10 A ranges. **Resistance:** ±(0.5% of reading +1 digit), except ±(1.0% of reading +1 digit) on 20 MΩ ranges. **Resolution:** AC/DC voltage 100 μV. DC Current 100 nA. AC Current 100 nA, Resistance 0.1 Ω. **Normal Mode Rejection:** 55 dB min. at 60 Hz. **Common Mode Rejection:** 90 dB min. at 60 Hz. **Numerical Display:** 3½ digits, 7 segment, 0.43″ LED, nonblinking with storage. **Conversion Rate:** 3 per second. **Overrange Indication:** Flashing digits beyond 1999 counts. **DC Polarity:** Automatic "+" or "−". **Rated Circuit-to-Ground Voltage:** (Maximum Common Mode Voltage): 1,000 volts (DC plus peak AC) maximum from any measuring terminal to power line (earth) ground terminal. **Power Requirement:** AC Operating or Battery Charging: 120 VAC or 220 VAC ±10% (check rear panel designation) 50-400 Hz, 5 VA nominal. Battery Operation: Four nickel-cadmium "D" size rechargable cells. Eveready type CH4 or equivalent (each cell is rated at 1.25 4-ampere-hours). Motorola Part Number 60-82750K02. Battery Operation Time (Continuous with fully charged battery): 8 hours nominal. Battery Recharge Time: 16 hours, nominal. **Temperature Range:** Operating: 0°C to +55°C. Storage: −40°C to +60°C. **Dimensions:** Height: 2.70 in. (68.6 mm). Width: 8/40 in. (213.4 mm). Depth: 9.00 in. (228.6 mm). **Weight:** Approximately 3 lbs. (1.36 kg) without batteries.

RANGES—DC VOLTAGE:

RANGE	MAXIMUM INDICATION	INPUT RESISTANCE	OVERLOAD PROTECTED TO
200 mV	±199.9 mV	≥10 MΩ	±1100 V
2 V	±1.000 V	≥10 MΩ	±1100 V
20 mV	±19.99 V	10 MΩ	±1100 V
200 V	±199.9 V	10 MΩ	±1100 V
1000 V	±1000 V (max. input)	10 MΩ	±1100 V

AC VOLTAGE: (Average-Sensing, RMS Calibrated Sine Wave 40 Hz to 10 kHz)

RANGE	MAXIMUM INDICATION	INPUT IMPEDANCE	OVERLOAD PROTECTED TO
200 mV	199.9 mV	10 MΩ at 75 pf	±650 VRMS
2 mV	1.999 V	10 MΩ at 75 pf	±650 VRMS
20 mV	19.99 V	10 MΩ at 75 pf	±650 VRMS
200 V	199.9 V	10 MΩ at 75 pf	±650 VRMS
600 V*	600 V (max. input)	10 MΩ at 75 pf	±650 VRMS

*Frequency Range: 40 Hz to 1000 Hz.

RESISTANCE:

RANGE	MAXIMUM INDICATION	TEST CURRENT	OVERLOAD PROTECTED TO
200 Ω	199.9 Ω	1 mA	135 VRMS
2 kΩ	1.999 kΩ	1 mA	135 VRMS
20 kΩ	19.99 kΩ	100 μA	250 VRMS
200 kΩ	199.9 kΩ	1 μA	250 VRMS
2000 kΩ	1999 kΩ	1 μA	250 VRMS
20 MΩ	19.99 MΩ	100 nA	250 VRMS

DC AMPS:

RANGE	MAXIMUM INDICATION	FULL RANGE VOLTAGE DROP	OVERLOAD PROTECTED TO
200 μA	±199.9 μA	200 mV	±2.5 A*
2 mA	±1.999 mA	200 mV	±2.5 A*
20 mA	±19.99 mA	200 mV	±2.5 A*
200 mA	±199.9 mA	200 mV	±2.5 A*
2000 mA	±1999 mA	200 mV	±2.5 A*
10 A	±10.00 A (max. input)	100 mV	±10 A

*Fuse Protected.

AC AMPS:

RANGE	MAXIMUM INDICATION	FULL RANGE VOLTAGE DROP	OVERLOAD PROTECTED TO
200μA	199.9 μA	200 mV	2.5 A*
2 mA	1.999 mA	200 mV	2.5 A*
20 mA	19.99 mA	200 mV	2.5 A*
200 mA	199.9 mA	200 mV	2.5 A*
2000 mA	1999 mA	200 mV	2.5 A*
10 A	10.00 A (max. input)	100 mV	10 A

*Fuse Protected.

RTL-4009A RF PROBE

Frequency Response: 10 kHz to 250 MHz within ±1 dB. **Probe Input Capacity:** 2.0 Pico-Farads. **Voltage Range:** 40 Volts RMS (Maximum). **Probe Accuracy:** ±3% of Full Scale on Voltage Ranges: 2 Volts FS and higher at mid-frequencies. **Maximum D.C. Input:** 400 Volts. **Rated Circuit-to-Ground Voltages:** 500 Volts Peak.

R-1001A DIGITAL MULTIMETER

R-1024A DIGITAL MULTIMETER

FEATURES

- **Shielded against RF fields**
- **Two-year battery life**
- **Single switch range selection**
- **In-circuit diode and transistor junction test**
- **Fast continuity function**
- **In-circuit resistance measurements**
- **Overload/transient protection**
- **10 ampere current shunt built-in**

R-1024A DIGITAL MULTIMETER

The Motorola R-1024A Digital Multimeter is so small and light that it fits in the palm of your hand and can operate up to 2000 continuous hours (two years normal use) on a common 9-volt battery. The unit offers convenient easy-to-use functions previously available only with an analog meter.

The R-1024A Digital Multimeter weighs only 16 ounces making it ideal for use away from the service bench. A convenient built-in tilt-bail snaps open for hanging the instrument when not in use or for propping the instrument up on a work bench. Anti-skid pads keep the instrument solidly in place when used in this position.

The unit is built for reliability. A single integrated circuit and 100% burn-in of each instrument assures dependability and performance. The instrument is RF shielded for proper operation in the radio servicing environment.

The Motorola R-1024A Digital Multimeter is supplied complete with a 9-volt battery test leads and an operator manual . . . ready for immediate use.

SPECIFICATIONS

GENERAL

Operating Temperature: 0 to 55°C. **Storage Temperature:** −40°C to +65°C, battery removed. **Maximum Common Mode Voltage:** 1500 VDC or peak AC. **Display:** 3½-digit LCD (1999 max. count). **Power:** Single standard 9 V battery, NEDA 1604. **Battery Life:** Alkaline: 2000 continuous hours typical. **Zinc-carbon:** 1600 continuous hours typical. **Low Battery Indicator:** Decimal point blinks during last 200 hours of battery life. **Shock and Vibration:** Meets MIL-T-28800 specifications. **Relative Humidity:** 0-80%, 0 to 35°C; 0-70%, 35°C to 50°C. **Temperature Coefficient:** Less than 15% of applicable accuracy spec. per °C (0°C to 20°C, 30°C to 50°C). **Dimensions:** 6.85 in. L x 3.65 in. W x 1.8 in. H; (17.4 cm L x 9.3 cm W x 4.6 cm H). **Case Material:** High Impact, Fire Retardant ABS plastic. **Weight:** 16 oz. (453 g) including battery. **Calibration Adjustments:** One adjustment. **Measurement Rate:** 4 Measurements per Second, nominal. **Accuracies are ±(% reading + no. of digits, 25°C + 5°C.**

MODEL NOMENCLATURE

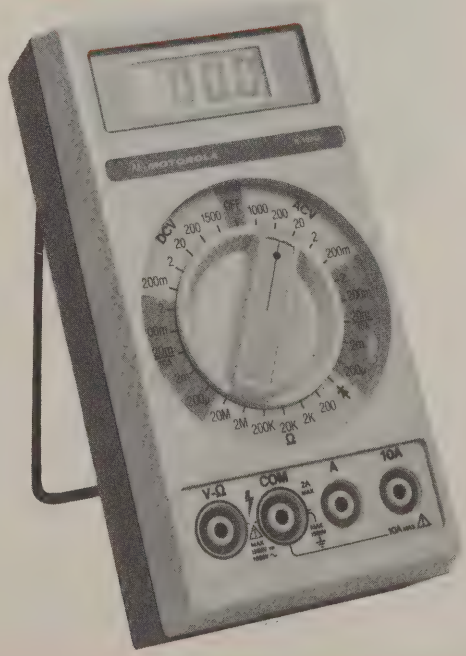
R-1024A	Digital Multimeter
RTL-4067A	High Voltage Probe
RTL-4068A	Test Lead Kit
RTL-4069A	Carrying Case

SPECIFICATIONS

DC VOLTAGE

Ranges: 200 mV, 2 V, 20 V, 200 V, 1500 V. **Resolution:** 100 μV on 200 mV range. **Accuracy:** 0.25% rdg. +1 digit. **Input Impedance:** 22 MΩ, all ranges. **Normal Mode Rejection:** >60 dB above 49 Hz. **Common Mode Rejection:** >160 dB up to 1500 VDC. **Response Time:** Less than 1 second. **Overvoltage Protection:** 1500 VDC or peak AC any range.

R-1024A DIGITAL MULTIMETER



AC VOLTAGE

Ranges: 200 mV, 2 V, 20 V, 200 V, 1000 V. **Resolution:** 100 μV on 200 mV range. **Accuracy—45 Hz-2 kHz:** 0.75% rdg. +3 digits; **2 kHz-5 kHz:** 1.5% rdg. +5 digits; **5 kHz-10 kHz:** 2.5% rdg. +9 digits; **10 kHz-20 kHz:** Not Specified. **Conversion Type:** Average sensing—RMS calibrated sine wave. **Input Impedance:** 2.2 MΩ shunted by <75 pF. **Response Time:** Less than 2 Seconds. **Overvoltage Protection:** 1000 VRMS/1500 V peak AC or 250 VDC (5 seconds max. above 450 VRMS 200 mV range).

RESISTANCE

Ranges: 200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ, 20 MΩ. **Resolution:** 0.1 Ω on 200 Ω range. **Accuracy 200 Ω to— 2 MΩ ranges:** 0.5% rdg. +1 digit; **20 MΩ range:** 1.5% rdg. +1 digit. **Maximum Open Circuit Voltage:** 500 mV. **Maximum In-Range Voltage:** 250 mV. **Maximum Test Current:** 2.5 mA. **Response Time:** Less than 1 second, except 20 MΩ range, less than 4 seconds. **Overload Protection:** 300 VDC or RMS AC any range.

CONTINUITY FUNCTION

Response Time: <100 milliseconds.

DIODE TEST

Range: 0 to 2 V. **Resolution:** 1 mV. **Accuracy:** 0.25% rdg. +2 digits. **Test Current:** 5 mA, ±10%. **Response Time:** Less than 1 second. **Overload Protection:** 300 VDC or RMS.

DC CURRENT

Ranges: 200 μA, 2 mA, 20 mA, 200 mA, 2 A, 10 A. **Resolution:** 100 nA on 200 μA range. **Accuracy 200 μA to 2 A ranges:** 0.75% rdg. +1 digit; **10 A range:** 1.5% rdg. +1 digit. **Response Time:** Less than 1 second. **Voltage Burden:** 250 mV maximum at full scale except 2 A and 10 A ranges, 700 mV. **Overcurrent Protection (A input):** 2 Amps/250 V (Fused). **Overcurrent Protection (10 A jnput):** Up to 20 Amps for 30 seconds (Unfused).

AC CURRENT

Ranges: 200 μA, 2 mA, 20 mA, 200 mA, 2 A, 10 A. **Resolution:** 100 nA on 200 μA range. **Accuracy 45 Hz-2 kHz (except 10 A):** 1.5% rdg. +3 digits; **45 Hz-400 Hz (10 A range):** 2.0% rdg. +3 digits. **Conversion Type:** Average Sensing. **Response Time:** Less than 2 seconds. **Voltage Burden:** 250 mV maximum at full scale except 2 A and 10 A ranges, 700 mV. **Overcurrent Protection (A input):** 2 Amps/250 V (Fused). **Overcurrent Protection (10 A input):** Up to 20 Amps for 30 seconds (Unfused).

AC-DC VOMS

T-1010A AC-DC VOM

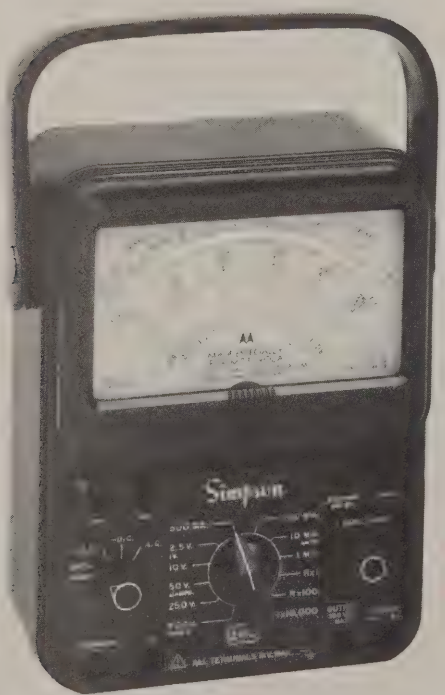
A. Popular because of its accuracy and versatility . . . this high sensitivity instrument features fast accurate measurements of AC and DC volts, DC current, resistance and dB in 27 ranges. Offers direct dial reading of amp-clamp ranges and external access battery and fuse compartment.

T-1010A	AC-DC VOM (Mirror Scale). Est. shpg. wt. 3-¾ lbs. (1.69 kg). Est. packaged dim. 10 x 6½ x 5¼ in. (25.40 x 16.51 x 13.34 cm).
ST-597	Carrying case for T-1010A.
ST-1084	Protective cover.

SPECIFICATIONS

Sensitivity: 20,000 Ohms/volts DC, 5,000 Ohms/volts AC. **Polarity Reversing Switch:** Makes DC measurements easier and faster . . . no lead reversal. **50 Microampere-230 Millivolt Range:** Gives more sensitive measurements . . . provides complete current coverage in six easy steps. **Popular DBM Ranges:** – 20 dBm to + 50 dBm, one milliwatt in 600 Ohms. **Improved Frequency Response in AC Measurements:** 5 to 500,000 Hz. **Full-Wave Bridge Rectifier System:** Provides more accurate AC voltage measurements. **Frequency Response:** Essentially flat through 50,000 Hz. **Size:** 5¼" x 7" x 3-⅛". **Batteries:** 9 V NEDA 1604 and 1.5 V "D" cell NEDA 13 F.

- **Time Proven**
- **Rugged taut band movement**
- **Mirrored Scaled**



A

T-1010A
AC-DC VOM

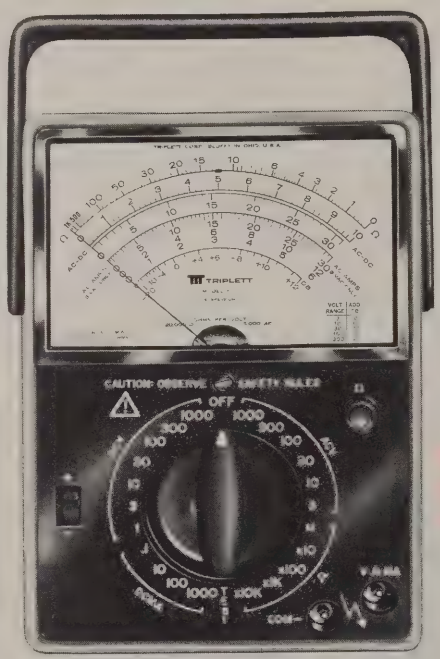
R-1026A MULTIPURPOSE EXTRA RUGGED AC-DC VOM

B. This instrument is extra rugged. It will withstand an accidental drop up to a five foot height.

Overload Protected . . . all ranges protected by diode and three fuse arrangement, including ⅛ amp, 1 amp, and 2 amp/1000 V fuses. The instrument is completely insulated; includes newly designed safety leads.

R-1026A	Est. shipping wt. 4 lbs. Est. packing dim. 7½ x 5¼ x 3¼ in.
RTL-4088A	Carrying Case for R-1026A.

- **Extra Rugged**
- **Overload Protected**
- **Safety Designed**



B

R-1026A
EXTRA RUGGED
AC-DC VOM

SPECIFICATIONS

RANGES

DC Volts: 0-0.3-1-3-10-30-100-300-1000 (Approx. 20,000 Ohms per Volt). **AC Volts:** 0-3-10-30-100-300-1000 (Approx. 5,000 Ohms per Volt). **Ohms:** 0-1 k-10 k- 100 k-1 MΩ-10 MΩ (12 Ohms center scale on low range). **DC Microamperes:** 0-100 at approx. 320 mV. **DC Milliamperes:** 0-10-100-1000 at approx. 320 mV. **Decibels:** – 20 to + 52 ("0" dB at 1 mW on 600 Ohm line). **Accuracy:** ± 2% DC; ± 3% AC; (full scale). **Scale Length:** 4½". **X'TRA Rugged**—Will withstand an accidental drop up to a five foot height with deviation from stated accuracy not exceeding ± 4%. **Overload Protected**—All ranges protected by diodes and unusual three fuse arrangement, including ⅛ amp, 1 amp and 2 amp/1000 V fuses. **Safety Designed** to most rigid safety standards to prevent explosive arcs in high energy circuits, up to the 2 amp/1000 V (20 kW) fuse capacity. **Meter:** Diode overload protected ruggedized suspension movement, easily replaced integral module, all range polarity reversing switch. **Confidence test:** Reassurance check of instrument meter. **Case:** Molded, International Safety Orange, high impact thermoplastic; easy external access to sealed battery and fuse compartment; molded plastic handle will hold tester at 30° angle; 5¼" W x 7½" H x 3¼" D. **Batteries:** NEDA 9 V 1604 (1), 1½ V 13 F (1). Complete with 48" safety test leads, screw-on insulated alligator clips, batteries, spare 1/8 and 1 A fuses and instruction manual. Shpg. Wt. 4 lbs.

VOLTMETERS

R-1008A FET VOM

C. The Model R-1008A Solid-State, Volt-Ohm-Milliameter, with LP OHMS® , offers an exceptionally wide range of measuring functions in a portable unit. It has been designed and engineered for fast in-circuit testing of electronic and electrical applications.

The instrument is designed for ease of operation with an easy-to-use pushbutton selection of measuring function and simplified scale. Coupled with a single range selector switch, you can select any of 46 ranges without confusing lead changes or other complicated set-ups.

One probe is used for all functions: DC, AC, MA and OHMS. The small, compact probe has a built in sliding switch which places an isolation resistor in series with the instrument on DC voltage readings. The Model R-1008A is frequency compensated from 50 Hz to 50 kHz. The solid-state circuit design requires no warm-up period and readings may be made immediately.

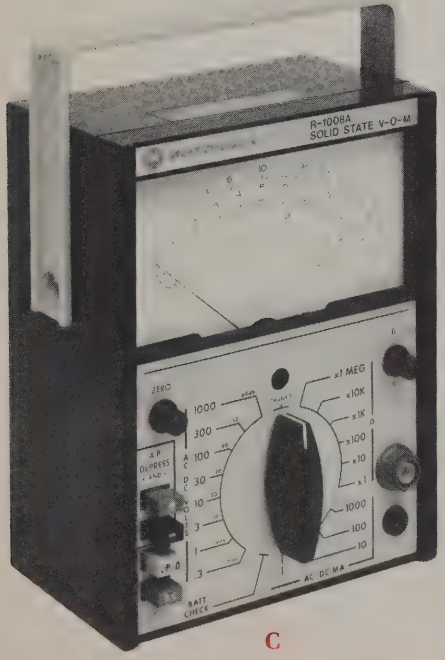
- **Exclusive New Low Power Circuitry Provides Battery Life in Excess of 1 year with Carbon Batteries left on continuously**
- **Low Power Ohms—6 Ranges with 70 mV Power Source for In-Circuit Measurements without Component Damage**

R-1008A	FET VOM with LP OHMS® , complete with leads, alligator clips, batteries, and instruction manual. Est. shpg. wt. 5 lbs. Est. packaged dim. 6½ x 5⅛ x 3 3/16 in.
ST-1090	Carrying Case.
RTL-4035A	High Voltage Probe.
RTL-4036	RF Probe.
RTL-4037A	Replacement test lead "positive."
RTL-4038A	Replacement test lead "common."
60-82282C01	Replacement battery (2 req'd), 9 V snap-on type.
60-82455G01	Replacement battery (1 req'd), 1½ V "D" cell.

SPECIFICATIONS

DC VOLTS:

DC Volts: 0-0.3-1-3-10-30-100-300-1,000. Input resistance 11.12 megohms with 1.12 Meg in Probe. **AC Volts:** 0-0.3-1-3-10-30-100-300-1,000. Input impedance 10 megohms. Frequency range 20 Hz to 10 kHz. **Ohms—Low Power:** 0-1k-10k-100k-1 M Ω-10 M Ω-1000 M Ω. (70 mV open circuit voltage, 123 μW maximum power applied to device under test, 10 Ohm center scale on low range). **Ohms—Conventional:** 0-1k-10k-100k-1 M Ω-10 M Ω-1000 M Ω. (1.5 V open circuit voltage, 56 mW maximum power applied to device under test, 10 Ohm center scale on low range). **AC and DC Millamperes:** 0-1-10-100-1000 at 316 mV. **Decibels:** −30 to +62 ("0" dB is equal to .776 V). **Accuracy:** ±3% all voltage and Ohms ranges, ±4% all Current ranges; (full scale). **Scale Length:** 4⅛". **Meter:** Diode overload protected suspension movement. **Case:** Shielded, molded, black, 5⅛" W x 3 3/16" D x 6½" H.



C

R-1008A
FET VOM

T-1017A Miniature VOM

D. One selector switch . . . 20,000 Ohms per volt DC and 5,000 volt AC sensitivity. Self-shielded for checking in strong magnetic fields with unbreakable plastic window. Complete with leads, battery and instruction manual. Accuracy 3% DC, 4% AC.

T-1017A	Est. shpg. wt. 1-⅛ lbs. (5 kg.) Est. packaged dim. 8 x 7 x 7 in. (20.32 x 17.75 x 17.75 cm.).
RTL-4039A	Replacement needle point leads.
ST-680	Carrying Case.
60-855262	Replacement Battery.
60-80333A83	Replacement Battery.

- **Lightweight**
- **Accuracy: 3% DC, 4% AC**

D

T-1017A
MINIATURE VOM

R-1011AA POWER SUPPLY

FEATURES

- **40 volt, 40 amp Capability**
- **Adjustable Voltage/Current Limiting**
- **Fully RFI/EMI Protected**
- **High Efficiency Switching Regulator Design**
- **High Reliability Design Includes Output Short Circuit Protection, Output Crowbar Circuit, Internal Thermal Overload Protection, Input Line Transient and Overvoltage Protection**

R-1011AA High Current Power Supply

The R-1011AA DC Power Supply provides a highly filtered, voltage regulated and current limited power source for servicing all types of solid-state communications equipment, from low power portable receivers to high power mobile transceivers.

The output voltage of 1-40 V is available in two ranges: 1-20 V or 1-40 V; and is continuously adjustable in either range. The output current is available in three ranges: 0-5 A, 0-20 A or 0-40 A; and provides up to 30 A continuously or up to 40 A intermittently. The continuous output power rating is 600 watts over the entire operating temperature range with 800 watts available intermittently.

RFI/EMI protection has been designed in to maintain a stable output voltage in close proximity to mobile transmitters over the entire frequency range, including the new 800 MHz band.

The excellent regulation, filtering and voltage stability makes it extremely useful for servicing all types of high powered mobile radio equipment without the need for external filters or batteries.

The high reliability typical of Motorola-designed products protects both the supply and the equipment being serviced against most forms of misuse and component failure. A controllable main power switch shuts down the supply under conditions of input overload, thermal overload and output overvoltage. An adjustable overvoltage sensing circuit triggers an output crowbar and shuts down the supply when the output voltage exceeds the preset level. Instantaneous current limiting circuits protect both the supply and load against a shorted output condition.

A high efficiency switching regulator design permits operation from a standard 15 amp, 117 VAC power source.

• Note: Jan. 1982 a 220-240 VAC, 50-60 Hz will be available. Order model number R-1011B

SPECIFICATIONS

Type: High efficiency switching regulator. **DC Output Voltage:** Two ranges; 1-20 volts, 1-40 volts with front adjustable overvoltage limiting. **DC Output Current:** Three ranges; 0-5 amp, 0-20 amp, 0-40 amp (30 amps continuous, 40 amps intermittent) with front adjustable current limiting. **Output Power Rating:** 600 watts continuous over operating temperature range, 800 watts intermittent. **DC Load Regulation:** .1% of full scale maximum for full line plus load variation. (.025% typical no load to full load). **Output Ripple & Noise:** 20 mVRMS maximum. **Temperature Stability:** .02% per degree C. **Drift:** .1% over 8 hours at constant line and load after ½ hour warmup. **Temperature Range:** Operating 0°C to +50°C; Storage −40°C to +75°C. **Meters:** Independent current and voltage readings on large 3.5″ meter scales, ±5% accuracy. **AC Line Input:** 105-130 VAC 50-60 Hz; 15 amp maximum line current required for 600 watt output. **Physical Characteristics:** Size: 16″ (40.6 cm) W x 8″ (20.3 cm) H x 20″ (50.8 cm) D; Weight: 75 lbs. (34 kgm). **General:** Output crowbar protection circuit, thermostats protect against thermal overload, input transient and overvoltage protection, RFI/EMI protected to allow operation in close proximity to all types of mobile radio equipment, separate high and low current output jacks, fuses on front panel, heavy duty removable three wire line cord.

R-1011AA
HIGH CURRENT POWER SUPPLY

S-1347D and S-1348D POWER SUPPLY

FEATURES

- **Adjustable in standby mode from 0 VDC at 0 amps to 20 VDC at 5 amps**
- **Two rugged taut band meters . . . voltage and current**
- **Automatic short circuit protection**
- **RFI/EMI shielding inhibits radiation from affecting operation**
- **Remote sensing . . . at load or at output jack**
- **Factory installed program option**

S-1347D AND S-1348D LOW CURRENT POWER SUPPLIES

This power supply is a virtual "must" for servicing portable radios or pagers drawing five amps or less. The unit features an extremely low ripple output for servicing even the most sophisticated solid-state equipment; excellent voltage regulation from no load, "receiver on" to full load, "full transmit" conditions; and current limiting to help prevent damage to equipment being serviced. Remote sensing capability at the load compensates for lead losses and insures that the correct operating voltage is applied to the radio being serviced.

A wide selection of voltage and current limiting ranges enhance the versatility and utility of this power supply. Ranges are especially designed to meet the needs of the two-way radio service shop. The two volt range, for example, is especially designed for servicing low level pagers and can be read and set precisely to 1.25 volts as required for most pager models. A factory installed programmable voltage option provides additional servicing speed and efficiency with this unique instrument. With this option programmed push buttons allow you to select one of three programmed voltages (as set by rear panel controls), as well as, retaining the front panel adjustable feature in the "pot adj" mode.

S-1347D Low-power, power supply less programmable voltage option.

S-1348D Low-power, power supply with programmable voltage option.

SPECIFICATIONS

S-1347D & S-1348D POWER SUPPLIES

Type: Series Pass Transistor Regulated. **DC Output:** Three Ranges; 0-2, 0-10, 0-20. **Current Output:** Four Ranges: 0-100 mA, 0-500 mA, 0-1 amp, 0-5 amp. **Load Voltage Regulation:** 0.03% or 2 mV for zero to full load change. **Load Current Regulations:** 0.04% or 2 mA. **Line Voltage Regulation:** 0.03% or 2 mV for 10% change in line voltage. **Ripple & Noise:** Less than 30 mvpp at any line voltage and load. **Input Power:** 105-130 VAC, 210-240 VAC, 50-60 Hz 200 watts. **Operating Temp Range:** 0°C-50°C. **General:** 11½ W x 6¾ H x 12½ D, wt. 26 lbs.

S-1348D
LOW CURRENT POWER SUPPLY

POWER SUPPLY AND INVERTERS

S-1360A VARIABLE POWER SUPPLY

Variable DC output from 5-18 volts at 3 amps makes the Motorola S-1360A Power Supply ideal for servicing transceivers and other electronic equipment. Separate voltage and current meters allow you to continuously monitor operating conditions. Regulation is ±0.5% and ripple and noise are less than 3 mVRMS Short circuit protected.

S-1360A **DC Output:** 5-18 volts, variable. **Regulation:** ±0.5%. **Ripple & Noise:** Less than 3 mVRMS.

S-1360A VARIABLE POWER SUPPLY

T-1041A 500-WATT INVERTER

T-1041A 500-WATT INVERTER

T-1041A is rated at 500 watts continuous, 550 watts max. (5 min.), 4½ amps no load. Unit is frequency controlled and features polarity protection and an overload pilot light.

T-1041A 500 watt DC to AC frequency-controlled Tripp-Lite, square wave inverter. Est. shpg. wt. 19 lbs. (8.55 kg). Est. packaged dim. 10¾ x 10¾ x 6¾ in. (27.31 x 27.31 x 17.15 cm).

T-1049A 1000-WATT INVERTER

T-1049A is a rated at 1000 watts continuous, 1100 watts max. (5 min.), 12 amps no load. Unit is frequency controlled and features polarity protection and an overload pilot light.

T-1049A 1000 watt DC to AC frequency-controlled Tripp-Lite, square wave inverter.

T-1049A 1000-WATT INVERTER

R-1005A BATTERY TESTER

R-1005A VEHICLE BATTERY TESTER

A self contained, integrated circuit, electronic device for testing storage batteries without discharge. Entirely new concept measures the "conductance" of the battery. Gives quick, accurate and reproducible results that correlate well with established load tests.

FEATURES

- **Quick Reading**—Instrument is simply clipped to the battery and switch turned to "KW." Meter shows maximum available power of battery. No need to make complicated measurements of amps, volts and time. Large 5½ inch meter.
- **No Load on Battery**—Self-contained, no batteries, powered by battery under test. Draws less current than a glove compartment light bulb; does not discharge battery during test.
- **Shows Maximum Available Power**—Measures the maximum power that battery can deliver; no calculations or corrections required.
- **Replaces Load Testers, Cell Voltmeters, Hydrometers**—Load testers must handle large currents and are, therefore, heavy cumbersome and expensive. Load Testers can also be harmful to the battery since they draw large currents. The Motorola Electronic Tester has the advantage of giving instant readings without discharging the battery and without the necessity of measuring amps, volts, time and temperature simultaneously.

SPECIFICATIONS

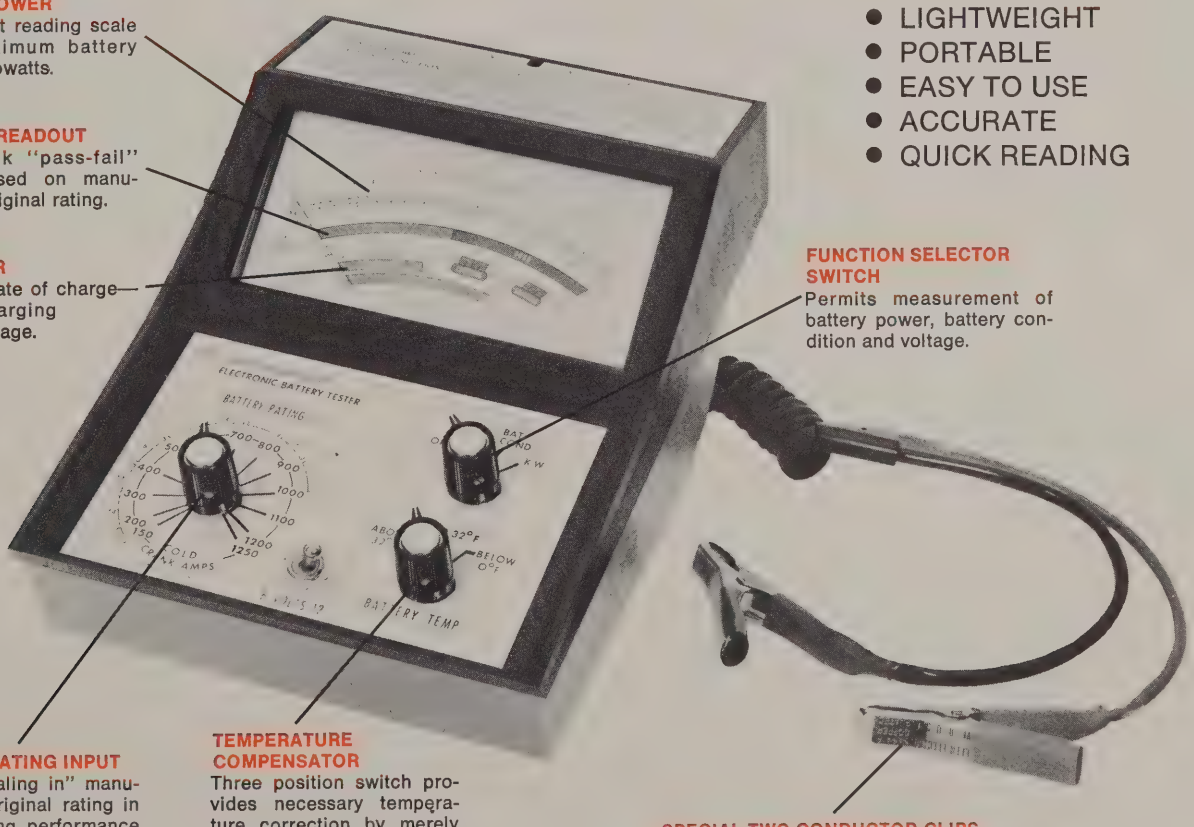
Measures 6 and 12 volt lead acid batteries rated from 150 to 1250 cold crank amps (25 to over 210 amp hours).

Readouts: 0 to 18 kilowatts. 0 to 16 volts, color coded "good/replace" scale. Battery temperature compensation. Reverse polarity protection. Over-voltage protection. **Temperature Range:** −40°F to 140°F (−40°C to 60°C).
Weight: 3.5 lbs.

FOR 6/12 VOLT BATTERIES UP TO 1250 AMPERES—SAE CRANKING PERFORMANCE RATING

Ideal for use in two-way radio servicing to insure that vehicle battery and charging system are in peak operating condition to power radio.

- LIGHTWEIGHT
- PORTABLE
- EASY TO USE
- ACCURATE
- QUICK READING



BATTERY POWER
Quick, direct reading scale shows maximum battery power in kilowatts.

PASS-FAIL READOUT
Gives quick "pass-fail" readout based on manufacturer's original rating.

VOLTMETER
Indicates state of charge—checks charging system voltage.

FUNCTION SELECTOR SWITCH
Permits measurement of battery power, battery condition and voltage.

BATTERY RATING INPUT
Permits "dialing in" manufacturer's original rating in SAE cranking performance amperes, watts or amp-hours.

TEMPERATURE COMPENSATOR
Three position switch provides necessary temperature correction by merely estimating battery temperature.

SPECIAL TWO CONDUCTOR CLIPS

MISCELLANEOUS SERVICE AIDS

TEST LEADS

Boost your servicing efficiency in the shop and field with these handy test leads.

Test leads with right angle pin tips, 1 minigator clip and 1 prod.

TEKA-19 Est. shpg. wt. 4 oz. (112 gr).

Test leads with right angle pin tips and minigator clips.

TEKA-18 Est. ship. wt. 4 oz. (112 gr).

Test leads with crocodile clips.

TEKA-20 Est. packaged dim. 3½ x 4 x 2 in. (8.89 x 10.16 x 5.08 cm).

Test leads with minigator clips.

TEKA-21 Est. shpg. wt. 4 oz. (112 gr).

Shielded test lead cable kit with dual banana plug and alligator clips.

SKN-6001A Est. shpg. wt. 1 oz. (28 gr).

Test lead cable kit with dual banana plug and crocodile clips.

TEKA-63 Est. shpg. wt. 3 oz. (84 gr).

4′-RF probe extension cable terminated in male BNC connectors.

01-855415 Est. shpg. wt. 2 oz. (56 gr).

RF probe cable terminated in female BNC connector.

01-855414 Est. shpg. wt. 4 oz. (112 gr).

UHF-BNC adaptor for RF probe extension cable.

58-855207 Est. shpg. wt. 2 oz. (56 gr)

4′-accessory cable terminated in 3 circuit phone plugs.

01-855413 Est. shpg. wt. 3 oz. (84 gr).

Test leads with right angle pin tips and prods—one red and one black.

TEKA-82 Est. shpg. wt. 3 oz. (84 gr).

E-Z HOOK TEST CONNECTORS

Patented hook tip connects anywhere. 1. Push to connect. 2. Push again to remove. Won't cut or nick. Won't short or jump off. Leaves your hands free for other tasks. "Q" ball design provides positive control for sub-miniature jobs. "Q" ball clips may also be used as a tiny mechanical hand for small parts.

Tip adaptor for .06″ needle probe.

ST-877 Est. shpg. wt. ½ oz. (14 gr).

Tip adaptor for .08″ standard probe.

ST-878 Est. shpg. wt. ½ oz. (14 gr).

Jumper-meter clips. Simply pull apart to attach your lead. Solder connection and strain relief assures long, trouble-free life.

ST-879 Est. shpg. wt. ½ oz. (14 gr).

"Q" ball with lead and banana tip.

ST-893 Est. shpg. wt. ½ oz. (14 gr).

"Q" ball with lead and standard tip.

ST-880 Est. shpg. wt. ½ oz. (14 gr).

Custom probe. Screw-on cover and special terminals allow you to custom design your own E-Z hook probe.

ST-881 Est. shpg. wt. 1 oz. (28 gr).

IN-LINE COUPLING UNIT WITH ADJUSTABLE TAP-OFF

This unique male and female UHF, in-line coupling unit features an adjustable BNC female tap-off. Use it with any frequency meter to monitor the output of low or medium power mobiles. Simply insert the coupling unit in series with the RF cable going to the wattmeter or dummy load. Depending on output power, loosen the jam nut and rotate the BNC tap-off to obtain the desired attenuation coupling.

SLN-6321A Est. shpg. wt. 8 oz. (224 gr).

DELUXE TEST LEAD KIT

Consists of convenient set of probes, test leads, and accessories. The silicone covered test leads have working voltage of 2000 VRMS and a maximum current of 20 amps. The leads are fitted with a shielded banana plug at each end and will accept a variety of accessories. Supplied with the deluxe test lead bit are 2 each:

—Test Leads
—Needle Point Probes
—Spring Hook Probes
—alligator clips
—spade lug terminals

RTK-4034A Deluxe Probe Kit

MOTOROLA
DPL Test Set
Encode Select
Decode Select
Level
Code Out
Inverted
Normal
PTT
Power
On
Inverted

S-1056C SERIES MOBILE TEST SET

S-1056C SERIES MOBILE TEST SET

Motorola Mobile Test Set connects to metering socket in radio for testing and aligning base station and mobile transmitters and receivers, regardless of operating voltage. Large, easy-to-read metering chart in cover—shows how to set selector switch for transmitter and receiver metering positions. Large, clear meter scales; 0-50 microamperes for readings in test positions; – 25 – 0 + 25 (zero center) for discriminator alignment; 0-1000 volts DC for B+; 0-15 volts DC for A+; 0.30 volts DC for microphone DC. Uses precision 2% resistors and 4-inch, 2% microammeter.

Transistorized IF Oscillator provides signal for IF alignment, 455 kHz to 13 MHz. Switch selects one of three crystals (455 kHz crystal supplied) sockets in chassis for plugging in 5.5 MHz and 12 MHz crystals (or others, as required). Test set with RF peaking generator (optional) provides a variety of crystal-controlled alignment frequencies.

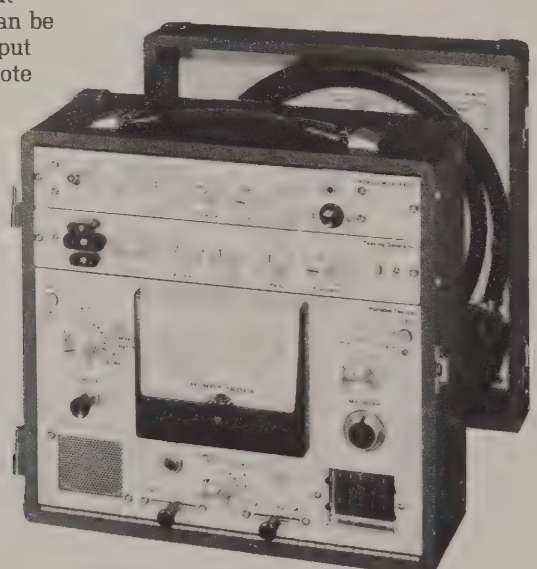
Transistorized Audio Voltmeter accurately measures receiver audio output for 20 dB quieting sensitivity test; 0-0.2 volts and 0-2 volts AC scales selected by switch on control panel. Also checks transmitter audio input directly through metering cable; can be used in setting base station line input controls, audio line levels and remote control console outputs.

MODEL NOMENCLATURE

S-1056C	Test Set, shipping weight: 15 lbs.
S-1057C	Test Set with Peaking Generator, shipping weight: 16 lbs.
S-1058C	Test Set with Deviation Meter, shipping weight: 18 lbs.
S-1059C	Test Set with Peaking Generator & Deviation Meter, shipping weight: 20 lbs.

ACCESSORY CABLES & ADAPTORS

SKN-6012B	Metering cable, terminated in 12 pin Motrac/Motran, Mitrek, Mocom 70 type connector
SKN-6013B	Metering cable, terminated in 11 pin standard connector: (included with above test sets as standard cable)
TKN-6025A	Adaptor cable for SKN-6013A & B, Converts 11 pin to small 12 pin Motrac/Motran, Mitrek, Mocom 70.
TEK-37A	Test set adaptor for Micor, Syntor, Syntor X, Trunked Syntor X, series includes 2 TEKA-72 test cables. Note: requires modification to all test sets shipped prior to Jan. 1, 1970.
TEKA-72A	Spare Micor, Syntor, Syntor X, Trunked Syntor X, test cables (can be used for metering or control)
TEKA-74A	Microphone adaptor, std. 4-prong to Micor, Syntor, Syntor X, and Trunked Syntor X.
NKN-6099A	PT400 series metering adaptor cable
SKN-6030A	Metering Cable for use with Maxar
RPX-4028A	Adaptor use with SKN-6030A to test 30/25 W High Performance Maxar Radios.



S-1059C
MOBILE TEST SET

CRYSTALS

AUL-1*†	Peaking Generator Crystal (For Receiver Alignment).
AUL-X*†	Peaking Generator Crystal (For use with Deviation Meter).
AQL†	Test Set Crystal 455 kHz to 800 kHz.
ANL†	Test Set Crystal 1.25 MHz to 13 MHz.

*Specify equipment operating frequency.

†Supplied by Motorola component products department.

REPLACEMENT ACCESSORIES

60-82455G01	repl. battery (1½ V. "D' cells) 4 req. (heavy duty industrial)
60-855262	repl. battery (1½ V. "N" cells) 1 req.
SLN-6294B	Case w/cover and carrying handle (for replacement)

OPTIONAL ACCESSORIES

The p-7208 Wattmeter Load is used in conjunction with Motorola Test Sets or a 0-50 micrometer to measure transmitter RF power output.

A calibration chart is supplied for use in correlating power dissipated in the load unit and the meter reading over the ranges of 25-50 MHz, 152-174 MHz, and 450-470 MHz.

P-7208	60 Watt Dummy Load, Shipping Weight: ¼ lb.

New low cost 8 watt RF load usable to 512 MHz. With UHF male plug.

S-1361A	RF Load.

Coaxial interconnect cables for connecting the transmitter to wattmeter and/or connecting wattmeter to termination load. Cables are terminated in PL/259 connectors.

1-891949	Coaxial Cable 12″, Shipping Weight: ¼ lb.
1-850834	Coaxial Cable 24″, Shipping Weight: ¼ lb.

SLN-6057C PEAKING GENERATOR

The Model SLN-6057A Peaking Generator is a crystal-controlled signal source which provides RF signals ranging from 4 MHz to 960 MHz. The generator is used for peaking of the RF stages of FM communications receivers operating within the 4 to 960 MHz range. It also provides normally encountered intermediate frequencies for alignment of receiver IF stages.

The peaking generator consists of a transistorized oscillator, internal and external crystal sockets, tuned circuits and front mounted controls and switches. It requires a separate 6 volt DC power source. The transistorized oscillator will operate properly with anti-resonant crystals.

The peaking generator is supplied with the S-1057C, and the S-1059C Portable Test Sets. It may also be purchased as a separate item to be mounted in the S-1056C, or the S-1058C Portable Test Sets. When mounted in the test set housing, the generator uses the battery supply built into the test set.

MODEL NOMENCLATURE
Accessories

SLN-6057C	RF Peaking Generator, shipping weight: 2½ lbs.
AUL-1†	Peaking Generator Crystal For Receiver Alignment.
AUL-X†	Peaking Generator Crystal For use with Deviation Meter.
ANL†	Crystal for IF Alignment 4 MHz to 6 MHz and 10 MHz to 13 MHz.
AUL†	Crystal for IF Alignment 6 MHz to 10 MHz.

†Supplied by Motorola Components Products Department.

S-1062B DEVIATION METER AND PANEL METER KIT

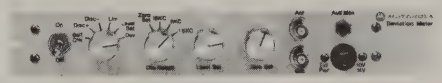
The S-1062B Deviation Meter and Panel Meter Kit utilizes a 455 MHz IF strip with a special discriminator and a peak-to-peak reading voltmeter. Fits directly into recent Motorola Test Sets and is used in conjunction with a signal generator or peaking generator as the local oscillator source.

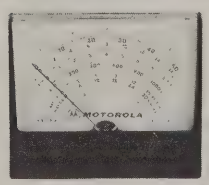
While the SLN-6080A Attenuator is designed for use with the S-1062B Deviation Meter, it can be used with any instrument where the signal is excessive.

MODEL NOMENCLATURE
Accessories

S-1062B	Kit includes Deviation Instrument, Panel Meter, Attenuator, Antenna and Battery. Shipping Weight: 5½ lbs.
SLN-6080A	Spare attenuator.
60-863919	Spare battery, mercury, 2 required.
SAN-6000A	Antenna.
72-82534D01	Meter.

IMPORTANT NOTE—Type AUL crystals normally used with the standard Motorola Peaking Generator cannot be used when the instrument is operated in conjunction with the Deviation Meter. Since they are used as a local oscillator source for the Deviation Meter, a different formula is required to determine crystal frequency. Always specify actual transmitter frequency and type AUL-X crystal. Example: AUL-X at 159.995 MHz.





TEK-28A TONE OSCILLATOR

The TEK-28A Tone Oscillator w/cable and battery is designed for panel mounting in the Motorola Portable Test Set. It has two frequencies (400 and 1000 Hz) for use in adjusting transmitter deviation, setting tone levels, and testing audio circuits. Provides one volt minimum when used to modulate transmitter audio circuits of 500 Ohms or higher.

MODEL NOMENCLATURE
Accessories

TEK-28A	Tone Oscillator w/cable and battery. Est. shipping weight 1½ lbs. (.68 kg).
TEKA-18	Test Leads with Clips.
TEKA-19	Test Leads with 1 Clip and 1 Prod.
TEKA-66	3-circuit phone plug to 4-prong mic connector.
60-82282C01	Spare Battery, 9 V.

TEK-5F METER PANEL

FEATURES

- **Panel styled for improved legibility. Saves time, simplifies operation.**
- **"Wide-Vue" Meters—enhance readability for greater accuracy—less change for error.**
- **Expanded Zero-Center Meter (25-0-25 μa) means greater accuracy in discriminator settings.**
- **Direct-Reading A+ and B+ Meters A+, 0-10 and 0-20 VDC; B+ 0-1000 VDC.**
- **Versatile design permits undershelf, upright or console mounting.**

TEK-5F METER PANEL

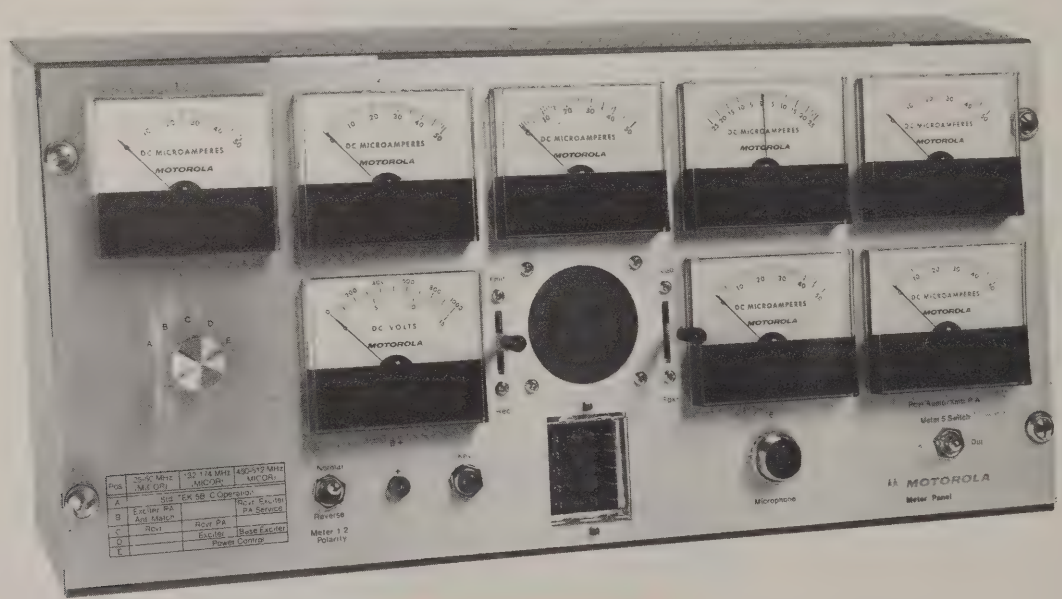
Latest version TEK-5F Meter Panel can be used to service all Motorola radios with metering sockets. A front panel switch reverses polarity on meters 1 and 2 for servicing MITREK Radios. When connected to the metering socket in a radio the TEK-5F Meter Panel assures efficiency and saves time for the service technician by providing simultaneous metering of positions one through six on transmitter or receiver—plus power amplifier plate current readings of the transmitter or audio output of the receiver.

The TEK-5F is particularly useful in fast detection of malfunctioning or intermittent sections of receivers or transmitters. The meter panel includes a built-in speaker that can be switched "in" or "out". In the "out" position, a load resistor is placed in the circuit. Position "4" is monitored by a 25-0-25 μa zero-center meter that provides a more precise reading during receiver alignment. On "Transmit," a shunt resistor is automatically switched in, changing meter sensitivity to 0-50 μa. Keying the transmitter can be carried out through use of a test microphone or a push switch located on the meter panel. Metering and Control Cables are not supplied and must be ordered separately.

MODEL NOMENCLATURE

Accessories

TEK-5F	Meter Panel complete with housing.
RPX-4028A	Adaptor. Use with SKN-6029A to test 30/25 W High Performance MAXAR Radios.
RPX-4053A	MITREK Radio Conversion Kit for TEK-5 (A-E).
SKN-6012B	Metering Cable, 12-pin MOTRAC/MOTRAN, MITREK, MOCOM 70 plug.
SKN-6013B	Metering Cable, 11-pin plug.
SKN-6029	Metering CAble for MAXAR, MOXY Radios.
TEKA-72A	Metering Control Cable for MICOR, Syntor, Syntor X, Trunked Syntor X Radios.



TEK-5F METER PANEL

RTC-1000A UNIVERSAL CONTROL PANEL

RTC-1000A UNIVERSAL CONTROL PANEL

Eliminate multiple control heads, microphones and cables for mobile servicing with the time and money saving Motorola Universal Control Panel. This compact unit fulfills all of the requirements for testing the majority of Motorola mobile units with a minimum number of accessories . . . just an added cable or two is all you need . . . ideal for the shop, even more advantageous in the service vehicle!

The unit is capable of operating 1, 2, 4, 8 and 12 frequency mobile units including the latest Conventional Syntor, Syntor X, Micor and Mitrek series radio. Scales on the frequency selector switch provide quick selection of switch positions versus radio being tested.

RTC-4006A basic control panel, the TEKA-43 metal housing which protects the unit and the RTL-4043A Junction Box with cable can be ordered separately. Order the complete assembly as the RTC-1000A Universal Control Panel.

MODEL NOMENCLATURE

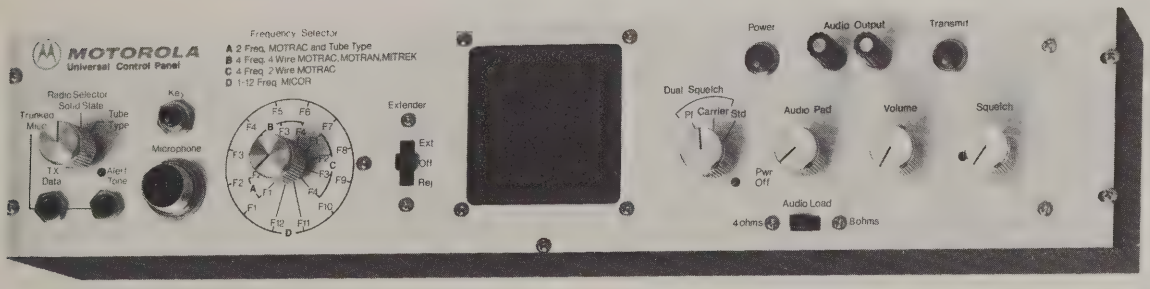
RTC-1000A	Complete with RTC-4006A Universal Control Panel, RTL-4043A Junction Box cable, and TEKA-43 Housing.
RTC-4006A	Universal Control Panel (less housing and junction box)
RTL-4043A	Junction Box and Cable.

ADAPTORS

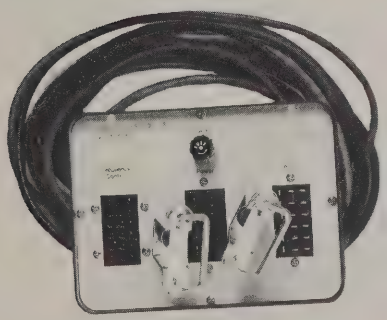
TEKA-74	Micor, Syntor and Syntor X mic adaptor to std. 4-prong plug.
RPX-4149A	Syntor X adaptor. Used with RTK-4006A adaptor cable for servicing up to 12 frequency conventional Syntor X.

ACCESSORY POWER AND CONTROL CABLES

MOBILE EQUIPMENT	VOLTAGE	ORDER CABLE KIT
Adaptor cable for 1-12 frequency conventional Syntor; Syntor X; and Micor radios. (Syntor X also requires RPX-4149A adaptor)	12 volt only	**RTK-4006A**
Adaptor cable for trunked Micor radio	12 volt only	**RTK-4019A**
Motrac, Mocom 70, or Mitrek Radio all models except Railroad.	12 volt only	**TEKA-48**
FMTR (10″ housing), FMTRU41V	6or 12 volt	**TEKA-49**
T41G and T43G Series, T41 GGV and T43 GGV Series, 6/12 Series	12 volt only	**TEKA-49**
U41 and U43 GGT Series "T-Power" Radio	12 volt only	**TEKA-49**
Adaptor cable for 1-4 frequency Micor series radio using 37 pin control power connector usable with previous TEK-25 and TEK-29 Series.	12 volt only	**TEKA-50**



RTC-4006A CONTROL PANEL



RTL-4043A JUNCTION BOX

RADIO METERING AND ADAPTOR CABLES

MICOR, SYNTOR, SYNTOR X, TRUNKED SYNTOR X RADIO

TEST SET ADAPTOR

TEK-37A test set adaptor can be used in conjunction with any S-1056-59C series test set. It consists of a 20 pin plug with switches and two TEKA-72A cables (1 control, 1 metering) to provide the necessary control and meter functions when testing the MICOR, SYNTOR, SYNTOR X, and TRUNKED SYNTOR X series radios. The adaptor provides receiver audio monitoring through the test set speaker, audio input and keying functions for the transmitter, and metering for all boards.

The kit is supplied with instructions for modifications which must be made to all S-1056A to S-1059A test sets, shipped before Jan. 1, 1970.

TEKA-37A MICOR, SYNTOR, SYNTOR X, TRUNKED SYNTOR X Radio Test set adaptor w/cables complete.

TEST CABLE

In conjunction with a Motorola test set or meter panel, the TEKA-72A MICOR, SYNTOR, SYNTOR X, and TRUNKED SYNTOR X Radio test cable is used as a metering cable or, with a slight modification, as a control cable. It consists of a 7-conductor cable with a 7-contact male connector plug at each end, one red and the other natural aluminum.

TEKA-72A MICOR, SYNTOR, SYNTOR X and TRUNKED SYNTOR X Radio Test Cable.

MICROPHONE ADAPTOR PLUG

The TEKA-74 adaptor plug permits the use of the MICOR, SYNTOR, SYNTOR X and TRUNKED SYNTOR X Radio microphone with MOTRAC Radio circular, four-conductor receptacles.

TEKA-74A MICOR, SYNTOR, SYNTOR X and TRUNKED SYNTOR X Radio to 4-prong mic. receptable.

SYNTOR FIELD TEST KITS

PROM Field Test Kits are programmed to provide troubleshooting aid for servicing synthesizer.

RPX-4108A VHF
RPX-4109A UHF
RPX-4111A Multi-PL
RPX-4112A Multi-PL System-90

Field Test Cable Kits interface the radio with a VCO or PL Module.

RPX-4113A VCO Module.
RPX-4114A PL Module.

CONVENIENCE CABLE KIT

The RPX-4170A SYNTOR X Convenience Cable Kit consists of three cables that are designed for ease of servicing the SYNTOR X radio. The kit consists of: Male Phono to BNC type cable Female Phono to BNC type cable UHF to N type cable.

RPX-4107A SYNTOR X Convenience Cable Kit.

RAILROAD MICOR RADIO

EXTENSION CABLE

Provides the capability of removing the entire power supply deck from the Railroad MICOR Radio and reconnecting to the radio with the extension cable.

TEKA-80 Railroad MICOR Radio Extension Cable.

BENCH TEST CABLE

This kit provides interconnection for bench testing of the Railroad MICOR Radio. It may be used with standard AAR models when removed from the mounting rack.

TKN-6044A Railroad MICOR Radio Bench Test Cable.

RAILROAD SYNTOR RADIO

EXTENSION CABLE

Provides interconnection for testing of the Railroad SYNTOR when removed from mounting rack.

RTK-4037A Railroad SYNTOR Radio Extension Test Cable.

MOTRAC, MOTRAN, MOCOM 70, MITREK RADIO

METERING CABLE

Designed for use with the S-1056 series Test Sets and TEK-5 Meter Panel, this assembly includes length of cable with 20-pin connector that plugs into test set or meter panel and terminates in 12-pin miniature plug. For use with MOTRAC, MOTRAN, MOCOM 70 and MITREK and solid state base station equipment.

SKN-6012B Metering Cable.

MCX-100

SERVICE AIDS

RTK-4036A Cable Kit.
RPX-4134A Speaker Load Modification Kit.
RPX-4144A 10 Pin Extender Cable.
RPX-4145A 12 Pin Extender Cable.

METERING CABLE

The SKN-6013B Metering Cable consists of a 20-pin connector that plugs into test set or meter panel and is terminated on the other end of an 11-pin plug (supplied with the S-1056 series Test Set).

SKN-6013B Metering Cable.

ADAPTOR CABLE

Adapts the standard 11-pin test set series metering cable to be used with the current MOTRAC, MOTRAN, MOCOM 70, and MITREK mobile radios and solid state base station equipment. Cable consists of an 11-pin chassis receptacle that mates with the test set plug and is terminated on the other end with a 12-pin miniature plug.

TKN-6025A Adaptor Cable.

MAXAR/MOXY RADIO

TEST CABLES

Metering cable and adaptor for testing MAXAR/MOXY Radios with S-1056 series test sets and TEK-5F Metering Panel.

RPX-4028A Adaptor for use with SKN-6029A and 6030 to test 30/25 w high performance MAXAR/MOXY Radio.
SKN-6029A Metering Cable for use with TEK-5F Metering Panel.
SKN-6030A Metering Cable for use with S-1056 series test set.

MISCELLANEOUS ADAPTORS

RF CABLE ADAPTOR

Properly couples the output of the signal generator directly to the RF stages in transistorized receivers for making stage gain measurements.

TEK-10 Cable Adaptor.

MICROWAVE CABLE ADAPTOR

BNC to phono RF adaptor connector. Required for trouble shooting STAR-POINT RF STation.

RSX-4021A Adaptor.

TEST SETS

S-1337A MODAT TEST SET

A. The S-1337A Test Set is designed to test the MODAT Mobile Data System encoder/decoder logic system. Six digital thumbwheels are provided to quickly set up the receive and send, time-slot codes for the unit under test.

An interconnect cable is provided for connection to the encoder/decoder for inserting the ID/call and data input boards for in-shop maintenance. The test set can be operated directly in a vehicle from the 12 volt battery or alternately a 117 VAC power supply is provided to perform "in-shop" tests. Standard ¾" spaced connectors are provided for connection to the 12 volt vehicle system.

Pushbutton switches are used to test the various modes of unit operation such as push to talk, hang-up test, call driver, and emergency. Proper operation is shown on the indicator lamps as the functions are initiated and performed.

A front panel BNC receptacle provides operating power for logic probe RTL-4014A when used with the BNC adaptor.

MODEL NOMENCLATURE
Accessories

S-1337A	Test Set, Modat ID encoder/decoder.
RTL-4014A	Logic Probe.
01-80303A01	BNC Adaptor.

RTL-4014A LOGIC PROBE

B. Can be used with the MODAT Mobile Data System Test Set (S1337A), Logic Probe RTL-4014A will detect and indicate logic levels and the presence and polarity of single pulses of very short duration. Operating power is obtained directly from the front panel of the test set using optional BNC adaptor. Indicator lamps on the probe provide an immediate visual indication of the condition existing in the circuit under test for step by step logic state testing. The probe can also be used to service other DTL, TTL or CMOS logic circuits independently of the test set. Simply connect to a 5 V source and ground on the board being tested.

RTL-4014A DTL, TTL, CMOS Logic Probe.

SPECIFICATIONS

Input Impedance: 100,000 Ohms. **Thresholds (Switch Selectable):** DTL-TTL, HTL-CMOS; Logic 1 Thresholds (HI-LED), 2.25 V ± .015 V, 70% Vcc; 30% Vcc. **Min. Detectable Pulse Width:** 50 Logic 0 Thresholds (LO-LED), 0.80 V ± .010 V, nanoseconds. **Max. Input Signal Frequency:** 10 MHz. **Pulse Detector (Pulse LED) (Switch Selectable):** High Speed pulse train or single events (+ or − transitions) activate ⅓ second pulse stretcher. **Pulse Memory (Pulse LED) (Switch Selectable):** Pulse or Level transition detected and stored until reset. **Input Overload Protection:** ± 50 V continuous 117 VAC for less than 15 seconds. **Power Requirements:** 5 Volt Vcc, 30 mA; 15 Volt Vcc, 40 mA; 36 Volts max. with power lead reversal protection. **Operating Temperature:** 0°C to 50°C. **Physical Size:** L x W x D: 5.8 x 1.0 x 0.7" (147 x 25.4 x 17.8 mm).

R-1019B METROCOM II TEST SET

C. The R-1019B Self Test Unit provides facilities for activating the microprocessor self-test functions of the Metrocom II Data Unit and the Vehicle Location Unit. These self-test programs check all the input and output lines and their associated interface hardware. It exercises the front panel liquid crystal display and LED indicators on the Metrocom II unit as well as certain audio circuits.

Tests are performed by observing indicator LED's on the Self Test Unit showing outputs from the Metrocom II Data or Vehicle Location Units. The technician can simulate inputs to the Data or Location Unit by closing the input switches the Self Test Unit.

The R-1019B provides four possible modes of testing the Metrocom II . . . a "normal" mode, a fully automatic mode, a manual mode, and a semi-manual mode.

MODEL NOMENCLATURE
Accessories

R-1019B	Metrocom II Self Test Set.
RTK-4015A	Test Cable.
RPX-4096A	Location Receiver Cable Kit. Use with LPU-1200 Location. Processing Unit.
RPX-4133A	Metrocom plus Conversion Kit for servicing Metrocom Plus.
RPX-4173A	Field Modification Kit converts a Metrocom Mobile Unit to a Base End Simulator as a system test aid.

SPECIFICATIONS

Power: Supplied by unit under test. **Weight:** 5 lbs. (with cables). 2.25 kg). **Size:** 5-¾" H x 8½" W x 7½" D (14.5 cm x 21 cm x 19 cm).

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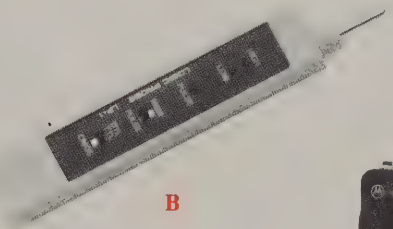
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C

R-1012B DVP TEST SET

FEATURES

- **Separate Encoder, Programmer and Decoder Operation.**
- **Duplex Capability.**
- **Unique Test Code for Servicing.**
- **Battery Operation for Portability.**

Shipment to countries outside the United States requires the customer to have a State Department Munitions License. Contact your Area Sales Representative for details.

R-1012B DVP TEST SET

The R-1012B DVP (Digital Voice Protection) Test Set provides facilities for checking the proper operation of the Digital Voice Protection circuits of a Motorola 2-way radio system. The test set utilizes a unique test code which can be inserted into any Motorola DVP radio for testing purposes thereby preserving security during servicing. This test code and its complement check the operation of the system for acceptance of all possible codes. There is no need for the service facility to know a user's code, thus maintaining system security. After servicing, authorized personnel simply reinsert the desired code in the radio. Alternately, the test set can accept coding from a Motorola DVP Code Inserter enabling the R-1012B to test DVP radios using that system's code.

To check receiver decoder circuits the encoder portion of the test set can be used to generate a coded audio message available at a 600 Ohm output. For servicing flexibility the audio signal can be obtained from a number of sources. An external audio signal can be applied to the test set through either the high impedance input or microphone input. An internal 1 kHz tone or the idle tone inherent in the DVP system can also be used.

To check transmitter encoder circuits the test set can accept a coded audio signal via its 600 Ohm input or a high impedance input. As indicated above either the test code preprogrammed into the test set or the user's code can be used as desired. If the input signal code matches the test code, the test set will unscramble the coded audio signal and present a digital audio signal at the scope output as well as audio through a built-in speaker.

Duplex capability allows both the encoder and decoder portions of a system to be checked at the same time for a complete system check when transmitting a signal from a repeater or base to a mobile or portable radio.

Battery operation provides complete portability for field servicing. The test set uses a standard HT220 battery, NLN-6761A (Part number 60-84642H01).

SPECIFICATIONS

Encoder Input (both inputs): 250 mV. **Encoder Output Level:** +10 dBm Max. **Decoder Input Level:** −15 dBm. **Operating Temp:** 0-50°C. **Battery:** Standard HT-220, NLN-6761A Part number 60-84642H01. **Battery Charger (internal):** 110 VAC or 220 VAC, 50/60 Hz. **Decoder EOM (end of message) time:** 80 msec. min.

R-1012B DVP TEST SET

SLN-6413A DPL TEST SET

SLN-6413A DIGITAL PRIVATE-LINE TEST SET

This Test Set is required for testing and troubleshooting "Digital Private-Line" squelch. It contains a separate "Digital Private-Line" encoder and decoder, and both may be used simultaneously if necessary. Thumbwheels on the front panel allow any possible code word to be programmed into the test set. In addition, separate code plug sockets are provided for both encoder and decoder sections of the test set so code plugs may be used to program the code word into the test set.

The Test Set can be used for both signal substitution and signal tracing methods of troubleshooting. The encoder generates any possible "Digital Private-Line" code word for injection into the equipment being tested. A PTT switch on the test set places the encoder in the transmit mode whenever desired, and the encoder can be locked in the transmit mode for continuous code generation. A level control adjusts the output signal level.

The decoder gives a visual indication if the point of measurement contains the proper word signal, and can thus be used for many signal tracing measurements.

Front panel switches allow the encoder output signal and decoder input signal to be inverted, if necessary, to match the signal polarity required by the equipment under test.

MODEL NOMENCLATURE

SLN-6413A Digital PL Test Set.

SPECIFICATIONS

ENCODER

Output Level: 0-3 V pp into 600 Ohms. **Output Imp:** Approximately 100 Ohms. **Output Code:** 000 to 777 octal. **Code Generation:** Thumbwheel switch or code plug with polarity inversion.

DECODER

Input Sensitivity: 25 mv pp. **Input Frequency Response:** 10 dB per octave roll off above 140 Hz. **Input Code:** 000 to 777 octal: **Code Comparison:** Against thumbwheel switch or code plug with polarity inversion capability. **Decode Detect Light:** When input code matches code plug or thumbwheel switch.

GENERAL

Power: AC: 115/230 VAC 50-60 Hz; DC: 10.8-15 VDC. **Size:** 8 W x 4-1/8 H x 9½ D. **Weight:** Less than 3 lbs.

SLN-6413A DPL TEST SET

S-1336B SUPERVISORY TEST SET

FEATURES

- **Pulse and digit count indicators.**
- **Automatic-manual operation.**
- **Five oscillators and output amplifier.**
- **Tone detector circuits.**
- **Timer circuit.**
- **Audio mute test.**

S-1336B SUPERVISORY TEST SET

The S-1336B Supervisory Unit Test Set provides facilities for servicing the VHF PULSAR supervisory units.

It simulates both transmit and receive functions of the base station providing a complete checkout of all supervisory unit circuitry.

The test set is housed in a convenient carrying case with a removable front cover. A power cord and test cable are stored under a hinged plate in the front cover. The unit may be powered from 117 VAC or 12 VDC.

All indicators are long life LED's (light emitting diodes). A digital numeric read-out labelled "pulse counter" is provided for indicating dialed digits from supervisory units. A panel mounted receptacle permits inserting the supervisory board directly into the test set for fast, efficient testing.

Tones for IMTS, MTS, and 2850 Hz systems are also provided. BNC connectors are provided for connecting the test set to audio input and output circuits on test equipment. This feature allows for complete "off-the-air" system checks when using a device such as a service monitor in conjunction with the test set.

MODEL NOMENCLATURE

S-1336B	Supervisory Test Set.

SPECIFICATIONS

Output Frequencies: 2805-2000-1800-1500-600 Hz. **Output Volts:** 1.0 V into 600 Ohms at 117 VAC line input. **Operating Temperature range:** −20°C (−4°F) to +60°C (140°F.) **Input Voltage:** 117 volts ±10%, 60 Hz AC or 13 volts DC ±10%. **Power Required:** AC operation—5.5 watts, Battery operation—3.5 watts.

S-1336B SUPERVISORY TEST SET

SERVICE AIDS

PULSAR RADIO SERVICE AIDS

RTX-4002A	Channel Indicator Board.
RPX-4001A	RF Cable Kit.
RPX-4067A	Dip Peak Cable Kit for proper alignment of Triselector in the VHF PULSAR Radio.
RPX-4078A	RF Cable Kit for VHF PULSAR Radio.
58-80322A17	Alternator Kit (replaces RTL-4006A.
RTK-4025A	MACS Extender Cable.

VHF PULSAR EXTENDER CIRCUIT BOARD KIT

RTX-1002A	Extender Board Kit includes the following: Supervisory Board Extender, IF Board Extender, Audio Board Extender, Interface Extender, TX Logic Extender, RX Logic Extender, Channel Display Board for adapting RTX-4002 UHF channel indicator board for VHF.

RADIO TEST ADAPTOR KIT

Permits use of the S-1056C Portable Test Set with MTS/IMTS radio.

TEN-6055A	Radio Test Adaptor Kit

RADIO DUPLEX SENSITIVITY MEASUREMENT ADAPTOR

Enables measurement of receiver sensitivity with duplex operation (with transmitter "on".) This is a coaxial T connector with a built-in attenuation arrangement to protect the signal generator from transmitter power output.

TEN-6056A	Radio Duplex Sensitivity Measurement Adaptor.

R-1022A PULSAR II TEST SET

FEATURES

- **Dynamic Test Mode**—The test set simulates the mobile radio portion of a car telephone in a simple go no-go dynamic test mode. This provides a fast, easy check of the control head and helps identify malfunctions in specific circuits.
- **Static Test Mode**—In the static test mode the test set simulates both the PULSAR II handset and cradle microprocessors. This provides complete analyzing and diagnostic capabilities. The continuous input can be used for circuit signal tracing.
- **Digital Displays**—The test set incorporates easy to read digital displays to provide positive verification of input data and clear indication of output data such as channel and telephone numbers.
- **Simple Test Programs**—A step-by-step test procedure with each step related to a specific signal input/output line and keyed to a special annotated schematic diagram make the test set easy to use for fast, efficient servicing.
- **Programming Switches**—These switches simulate the diode matrix on the radio interface board to allow servicing of the various production models as well as helping to identify a defective board.

R-1022A PULSAR II/100 CONTROL HEAD TEST SET

The PULSAR test set enables the technician to dynamically test the PULSAR II or 100 car telephone control heads by simulating all functions of the radio system. Digital data displays verify data entered via the keypad and also indicate test results for fast efficient servicing. Simple go no-go segmented test programs make for easy, uncomplicated testing allowing a technician with no in-depth knowledge of the control head circuitry, digital systems, or microprocessors to check out a unit. The test set is connected to the control head cradle connector, taking the place of the mobile radio and its associated logic circuits. A special adaptor (order separately) is used for testing the PULSAR 100 control head. Programming switches allow servicing the various functional models of the PULSAR II system as programmed on the radio interface board.

In the dynamic test mode the test set displays the channel number produced by the control head microprocessor and the telephone number dialed or recalled from memory to verify that the output of the control head is correct.

A step-by-step static test procedure and a special annotated PULSAR II schematic diagram provided with the test set provide complete analyzing and diagnostic capabilities. Data for each step of the test is entered via the keypad and test results are indicated on a digital display. The signals generated by each test set-up are continuously applied to the control head and can be used for circuit signal tracing. Input data may be easily erased or changed with the press of a button. Each step is related to a specific input/output signal line for rapidly localizing malfunctioning circuits and faulty components.

The test set can also provide a steady state (DC) source of logic signal to a circuit for further analysis (DC level measurements) when the programmed test procedures indicate a malfunction in that particular circuit.

R-1022A PULSAR II TEST SET

MODEL NOMENCLATURE

Accessories

R-1022A	PULSAR II/100 Control Head Test Set.
RTL-4057A	Optional PULSAR 100 Adaptor.
RTK-4022A	Replacement vehicle cigarette lighter power cable.
ST-880	Replacement test probe kit.
RTK-4020A	Replacement 26-conductor microprocessor test cable.
1-80308A42	Replacement 34-conductor control head test cable.

SPECIFICATIONS

Power: 110/220 V 50-60 Hz, 15 watts or 12 VDC, 0.8 A max. **Size:** 12″ x 12″ x 8″ D (30.5 cm x 30.5 cm x 20 cm). **Weight:** 10 lbs. including all accessories (4.5 kgms).

R-1800A DIGITAL ANALYZER CONTROLLER

FEATURES

- **Prom Reader/Programmer**—User can read, write, and verify: PROMS, code plugs, and memory modules with apropriate application software kit and adaptor module.
- **Built-In Logic Probe**—Internal logic probe displays circuit status by hi-lo indicator lights which are also accessible by the microprocessor.
- **A/D Converter**—Has the capability of measuring analog voltage from + 1.25 volts to – 1.25 volts as part of specific application programs.
- **Optional RS-232 Serial Interface**—Provides for interface to modems, printer, or other serial devices: baud rate is selectable under program control.
- **Self Test**—Verifies proper operation of the instrument.
- **Portable/Lightweight**—Instrument is housed in a rugged portable carrying case weighing only 25½ lbs.
- **Human Engineered**—Data entry via easy-to-use typewriter style keyboard with audible feedback.
- **Expandable**—Provision for option modules coupled with 16 program sockets for user ROMs provides for future applications.

R-1800A DIGITAL ANALYZER/CONTROLLER

The new Motorola R-1800A Digital Analyzer/Controller forms the nucleus of a service system designed to offer the user a full range of comprehensive, programmed testing and diagnostic functions.

The instrument consists of a basic hardware unit with specific, pre-programmed applications packages added to determine the actual functional mode. Each software package is designed to service a specific Motorola product, thus eliminating the need for a variety of individual, specialized test sets. To meet future needs, new application software will be made available.

Application software is provided in the form of pre-programmed software modules or application ROMs, thus eliminating the need for the user to develop complex programming skills. When the user orders the appropriate software application program kit, he receives an application ROM together with an instruction manual. The user ROM is permanently inserted in one of 16 sockets on a plug-in board found inside the instrument. The application program is then accessed by name via an easy-to-use typewriter-style keyboard and 32 character alpha-numeric display. The application program then takes over operation of the unit and provides prompts to the user for an interactive mode of operation. All software application program kits are supplemented with an instruction manual which explains all prompts and operating options to facilitate overall ease of operation.

R-1800A DIGITAL ANALYZER CONTROLLER

A Reader/Programmer module option that interfaces with the Digital Analyzer Controller via I/O ports provides the added capability to program, read, and verify: ROMs, memory modules, and code plugs. The module is contained in the top cover of the unit which also provides space for additional hardware interface modules for future applications. For those applications which require the Reader/Programmer only, a desk top console model is also available.

The basic Digital Analyzer Controller is a bus organized microprocessor system consisting of the Motorola 6808 microprocessor, a field of 16 applications ROM locations, multiple I/O ports which are software definable, and separate executive and application RAM. Each user ROM can contain up to 8K bytes of program. (The unit will accept a family of interchangeable 2K, 4K, or 8K byte sized ROMs without requiring any internal changes.) Basic user RAM is 1K byte with an additional 3K bytes available as an option.

The basic unit contains 4 PIA's (64 I/O lines) which are all applications software definable.

The mainframe contains a power supply which is switch-selectable between 115 and 230 VAC. It has full capacity to supply power to interface modules mounted in the cover of the unit. The power supply is overload protected with current limiting circuits.

When turned on, the instrument goes through a brief self test to verify proper operation of the unit. More extensive self tests and listing of installed programs can be done from the front panel with the appropriate user commands.

MODEL NOMENCLATURE

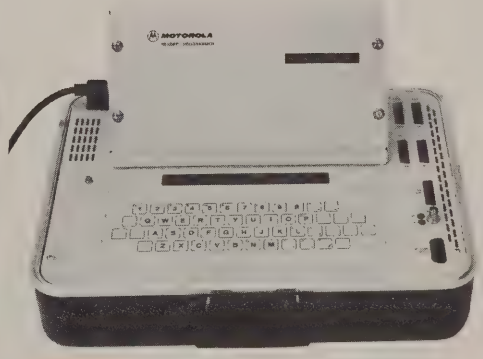
R-1800A	Digital Analyzer Controller.
R-1800A/220	Digital Analyzer Controller—220 V.
R-1800A/M	Digital Analyzer Controller with additional 3K RAM.
R-1800A/M 220	Digital Analyzer Control with additional 3K RAM—220 V
R-1801A	Digital Analyzer Controller with Reader/Programmer—attache model
R-1801A/220	Digital Analyzer Controller with Reader/Programmer—attache model—220 V
R-1801A/M	Digital Analyzer Controller with Reader/Programmer—attache model—additional 3K RAM
R-1801A/M 220	Digital Analyzer Controller with Reader/Programmer—attache model—additional 3K RAM—220 V
R-1821A	Digital Analyzer Controller with Reader/Programmer—console model
R-1821A/220	Digital Analyzer Controller with Reader/Programmer—console model—220 V
R-1821A/M	Digital Analyzer Controller with Reader/Programmer—console model—additional 3K RAM
R-1821A/M 220	Digital Analyzer Controller with Reader/Programmer—console model—additional 3K RAM—220 V
RTL-4011A	Probe

SPECIFICATIONS

Display: 32 character, alpha numeric; vacuum fluorescent. **Keyboard:** Full typewriter format. Membrane switches with audible feedback. **Program Capacity:** 8 program ROMs, (2K, 4K, or 8K Byte each). **Applications RAM:** 1K byte basic, expandable to 4K byte. **I/O Control Lines:** 4 PIA's of 16 lines each, plus 4 additional control lines. (TTL logic level compatible. **Logic Probe Input:** Impedance—10 M Ω at TTL levels. Threshold levels—Low .8 V; High 2.3 V. Max. Frequency—300 kHz (program dependent). Max. Input Level— + 15 V. Indicator Mode—Front panel LED's plus accessible by user program. **Analog Input:** Impedance—300K Ohms min. Measurement Range: − 1.25 V to + 1.25 V. Resolution—8 bits. Max. Input— ± 15 V. Sampling Time—200 μs min. (program dependent). Indicator Mode—User program controlled. DC Accuracy—5% of full scale. **Environmental:** 0°C to + 50°C operating; − 25° to + 65°C storage. Meets EIA Std. RS152B specs for mechanical shock and vibration as well as humidity. **Input Power Requirement:** 100 to 130 VAC internally switchable to 200 to 260 VAC. 50/60 Hz line frequency. 120 watts max. input power (with max. accessory load). **Accessory Power Connector on Front Panel for user applications and interface panels:** + 5 VDC, 1 Amp (Regulated). + 15 VDC, .4 Amps (Regulated). − 15 VDC, .2 Amps (Regulated). + 34 VDC, .5 Amps (Unregulated). **Physical:** Width—18.25″ (46.4 cm). Depth—14″ (35.5 cm). Height (cover closed—7″ (18 cm). Weight—25½ pounds.

R-1801A

The attache-style Digital Analyzer/Controller with reader/programmer has additional compartments in the lid for expansion of hardware interface modules.



R-1821A

The console style Digital Analyzer/Controller is ideal for applications which require only the reader/programmer.

READER/PROGRAMMER REQUIRED ACCESSORIES AND SUPPLIES

FEATURES

With the Reader/Programmer option and appropriate software, the user will be able to read, write, and verify Code Plugs and Memory Modules for a large and growing list of Motorola synthesized radio products.

- Read and test Code Plugs and Memory Modules . . . verify content and test the Code Plugs.
- Program Code Plugs and Memory Modules for Motorola radios quickly and easily.
- Read an existing Code·Plug or Memory Module . . . modify the data and program a new module.
- Duplicate existing Code Plugs and Memory Modules for system expansion.

DIGITAL ANALYZER/ CONTROLLER

READER/PROGRAMMER OPTION

SOFTWARE APPLICATION

The R-1800A Digital Analyzer Controller requires various software Application Program Kits and Adaptor Boards for utilizing the Reader/ Programmer option of the unit.

All software application program kits will be provided by Motorola, thus eliminating the need for the user to develop any programming skills.

The user will need to order separate Application Program Kits, Adaptor Boards, and Blank Code Plugs/Memory Module Kits (required for programming applications) for the various Motorola radio products the Reader/ Programmer can be used with.

Application Program Kit—consists of a pre-programmed user ROM and instruction sheet that directs the user through the full application function.

Adaptor Board—required to interface the various Code Plugs and Memory Modules with the Reader/Programmer.

Blank Code Plug/Memory Module Kit—consists of a blank PROM and adhesive label.

READER/PROGRAMMER REQUIRED ACCESSORIES AND SUPPLIES

DESCRIPTION	APPLICATION PROGRAM KIT	ADAPTOR MODULE	BLANK CODE PLUG/MEMORY MODULE KIT
PAGING:			
MEC 5 TONE	RTL-4800A	RTL-5801A	NLN-8192A
TEC METRO	RTL-4800A	RTL-5803A	NLN-4658A
BHC METRX	RTL-4800A	RTL-5803A	NLN-5034A
MAC METRO	RTL-4800A	RTL-5800A	NLN-8915A
AGC METRX	RTL-4800A	RTL-5800A	NLN-4150L
BPR 2000	RTL-4800A	RTL-5800A	RPX-4405A
SYNTOR:			
RF 16 CHANNEL	RTL-4802A	RTL-5818A	RPX-4407A
RF 32 CHANNEL	RTL-4802A	RTL-5818A	RPX-4408A
PL/DPL + SYST. 90 ONE CODE;		NOT FIELD PROGRAMMABLE	
PL 32 CODE	RTL-4803A	RTL-5818A	RPX-4409A
SYST. 90 ● S MULTI PL	RTL-4803A	RTL-5820A	RPX-4410A
DPL 16 CODE	RTL-4804A	RTL-5820A	RPX-4410A*
DPL 32 CODE	RTL-4804A	RTL-5820A	RPX4410A**
MCX-100:			
RF 16 CHANNEL	RTL-4805A	RTL-5818A	RPX-4411A
RF 32 CHANNEL	RTL-4805A	RTL-5818A	RPX-4412A
PL/DPL	RTL-4806A	RTL-5818A	RPX-4413A
SELECT V	RTL-4807A	RTL-5820A	RPX-4414A
RSX-410 SYNTOR:			
RF-12 CHANNEL	RTL-4808A	RTL-5804A	RPX-4415A
MX-300S:			
RF 48 CHANNEL	RTL-4809A	RTL-5805A	RPX-4416A

* Requires two each.

** Requires four each.

For additional accessories and new applications contact Motorola Test Equipment Products.

SERVICE AIDS

MX-300 SERVICE AIDS

PORTABLE RADIO TEST SET

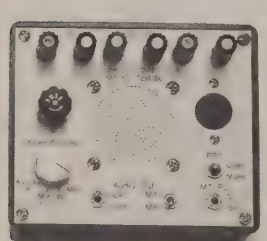
A. Provides capability of testing many transmitter and receiver functions. Transmitter modulation and keying can be simulated and receiver trouble-shooting points can be tested without opening up the radio. With the Portable Radio Test Set a variety of service functions can be performed. Use RTK-4021A test cable when testing MX-300 radios.

RTX-4005A Portable Radio Test Set.
RTK-4021A MX-300 Test Cable.

MX-300 BATTERY ELIMINATOR

B. Designed to physically replace the "MX-300" series radio battery pack when operating with an external DC power supply. Provides over-voltage, reverse polarity, short circuit, and transient protection for the radio. Two binding posts are provided for connection to an external voltmeter to monitor voltage being applied. Electrical and physical connections to the radio are accomplished by a cam-lock mechanism identical with those found on the radio battery packs.

ST-1175 Battery Eliminator.



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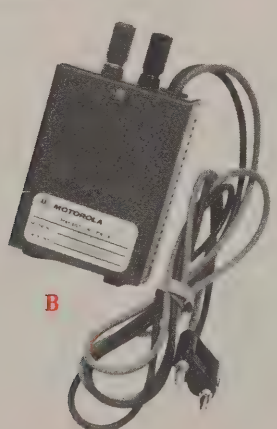


B

MX-300 BATTERY TESTER

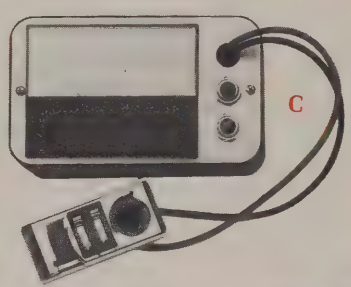
C. Provides a means of easily testing a battery under simulated load conditions. Two loads can be switched in to simulate 2W and 5W MX-300 series radios, and the voltage of the battery is read on a self contained voltmeter.

ST-1177 Battery Tester.

CHARGER TESTER

D. Measures charge current, thermistor switch point for rapid charging, and voltage cut-out points.

ST-1176 Charger Tester.



C

D

PAC·RT TEST SET

E. This Test Set simulates the control unit/vehicular charger and mobile controls. It enables the serviceman to test the PAC·RT vehicular repeater separate from the mobile radio.

S-1351A PAC·RT Test Set.

ACCESSORIES & SERVICE TOOLS

RF ADAPTOR CABLE

A 12″ coaxial cable with a type "BNC" male connector, one end connecting to test equipment and the other end of the cable with a plug for attachment directly to the radio (NKN6222).

SKN-6028A RF Adaptor Cable.

MICROPHONE TEST ADAPTOR CABLE

A cable used to test all remote microphones in conjunction with the ST-855B microphone tester.

ST-1178 Microphone Test Adaptor Cable.

MX-300 UNIT ID AND ID/EMERGENCY SERVICE AIDS

RTL-4002A Unit ID Extender.
RTL-4003A ID/Emergency Extender.
TEK-81 Unit ID Code Plug Verifier.
TEK-83 Unit ID Sequencer.

MX-300 DVP SERVICE BOARDS

RTL-4077A Extender Board Kit
RTL-4078A Jumper Board Kit

E

MT-500 SERVICE AIDS

PORTABLE RADIO TEST SET

A. Provides capability for testing many transmitter and receiver functions. On universal models transmitter modulation and keying can be simulated and receiver troubleshooting points can be tested without opening the radio. With the radio front cover removed, all MT-500 models are allowed the same convenience. Test Set used in conjunction with test cables RTK-4000A and RTK-4001A.

RTX-4005A	Portable Radio Test Set.
RTK-4000A	Allows Universal MT-500 models to be tested with covers in place.
RTK-4001A	Allows all MT-500 models (Basic or Universal) to be tested without covers in place.

BATTERY ELIMINATOR

B. Battery Eliminator allows an external power source to be used for servicing the radio in place of the battery. Also provides convenient test jacks for measuring input voltage and current with a Motorola S-1063C DC Multimeter.

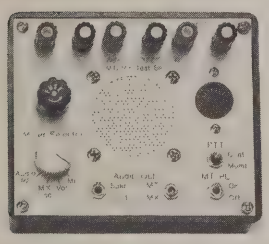
TEK-44 Battery Eliminator.

BATTERY TESTER

C. Battery Tester allows you to check nickel-cadmium batteries either in or out of the radio. Mercury and alkaline batteries must be removed from the radio for testing. Also, in radios with diode protection in the charging contacts, nickel-cadmium batteries must be removed for testing. Expanded range voltmeter indicates battery voltage . . . less than 11 volts for nickel cadmium batteries or less than 10 volts for mercury batteries indicates marginal operation and the battery should be recharged or replaced. Expanded range, from 9½ to 17½ volts, provides extra high resolution for easy reading.

Both high and low current loads allow you to check any type of battery under load by simply pushing a button. Alternately, nickel-cadmium batteries in the radio may be tested under load by keying the transmitter. Two test lead jacks are available for testing batteries out of the radio. (Order test leads separately.)

TEK-48	Battery Tester.
TEKA-82	Test Leads for TEK-48 Battery Tester.



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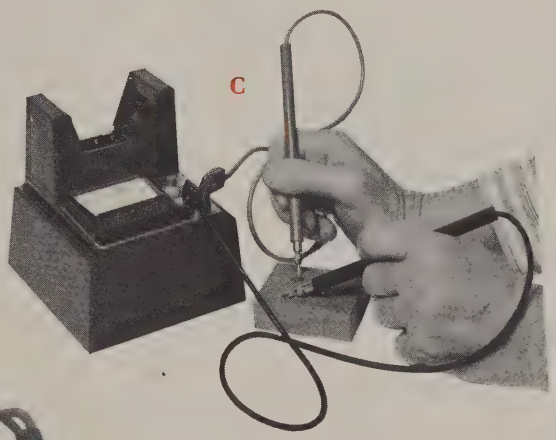

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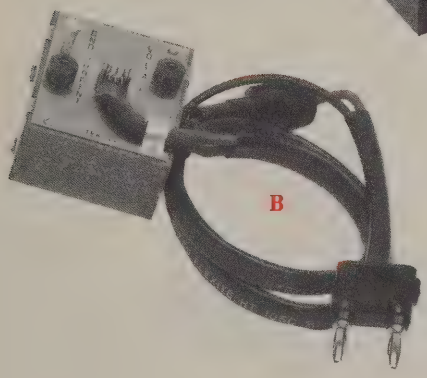


B

PAC·RT TEST SET

D. This Test Set simulates the control unit/vehicular charger and mobile controls. It enables the serviceman to test the PAC·RT vehicular repeater separate from the mobile radio.

S-1351A PAC·RT Test Set.

ACCESSORY CABLES

TEST CABLE

6-inch coaxial cable (with BNC connector on one end, radio side connector interface on other end) allows RF measurements of the MT-500 Universal model to be made from the radio side connector. Test Set is not required for this measurement.

RTK-4003A Test Cable.

ADAPTOR INTERCONNECT CABLES

Allows the two MT-500 P.C. boards to be connected together while one is removed from the housing. The radio can be powered and operated during servicing.

RTK-4008A	For VHF Radios.
RTK-4009A	For UHF Radios.

TUNE-UP CABLE

Provides for connection of the radio's RF (antenna jack) and audio jack to test equipment.

NKN-6248A Tune-up cable.

RF ADAPTOR CABLE

12 inch coaxial cable (with BNC connector on one end, a miniature phone plug on the other end) allows connection of the radio RF to test equipment or mobile antenna.

NKN-6247A RF Adaptor Cable.

CHANNEL PRIORITY SCAN SERVICE AIDS

RTK-4024A	Test Adaptor Cable
RTL-4066A	Interface Extender Cable

D

HT SERVICE AIDS

HT-220 TEST FIXTURE

A. This unique universal test fixture is an invaluable service aid for complete service setups on both omni and slim-line Handie-Talkie Radios. The TEK-43 provides total metering facilities to allow rapid connection to the various metering points on the circuit board. A built-in speaker allows the radio to be operated with both front and rear covers removed. Other features include adjustable probes for precise placement, automatic keying, and test jacks for monitoring the DC power supply and radio metering points. Speaker loads are selectable by panel switches for maximum versatility.

TEK-43	Complete Test Fixture with metering switch selection.
TEKA-78	Spare holding frame for TEK-43.

BATTERY ELIMINATOR

B. The TEK-44 Battery Eliminator allows an external power source to be used for servicing the HT-220 Handie-Talkie Radio in place of the battery. The kit also provides convenient test jacks for measuring input voltage and current with a Motorola S-1063C DC Multimeter.

TEK-44	HT-220 Battery Eliminator.

HT-220 BATTERY TESTER

C. The TEK-48 Battery Tester allows you to check HT-220 nickel-cadmium batteries either in or out of the radio. Mercury and alkaline batteries must be removed from the radio for testing. Also, in newer model radios with diode protection in the charging contacts, nickel-cadmium batteries must be removed for testing. Expanded range voltmeter indicates battery voltage ... . less than 11 volts for nickel-cadmium batteries or less than 10 volts for mercury batteries indicates marginal operation and the battery should be recharged or replaced. Expanded range from 9½ to 17½ volts, provides extra high resolution for easy reading.

Both high and low current loads allows you to check any type of HT-220 battery under load by simply pushing a button. Alternately, nickel-cadmium batteries in the radio may be tested under load by keying the transmitter. Two test lead jacks are available for testing mercury batteries. (Order test leads separately.)

TEK-48	HT-220 Battery Tester.
TEKA-82	Test Leads for TEK-48 Battery Tester.

TUNE-UP ADAPTOR KITS

KITS CONSIST OF:

Antenna Adaptors—These adaptors are used to properly match the antenna impedance of the radio to 50 Ohms. Each adaptor is designed for a specific frequency band and is terminated in a BNC connector.

Housing Adaptors—These adaptors allow electrical connection to the antenna (1-80791A42) and are used to connect the sleeve on the omnihousing to the main frame (1-80791A43) when the back cover of the radio is removed.

Antenna/Control Wrench—This wrench is used to remove the antenna and can also be used to remove the nuts on the squelch and volume control pots.

HT-220 VHF Tune-Up Adaptor Kit

NKD-6001B Adaptor Kit.

HT-220 UHF Tune-Up Adaptor Kit

NKE-6003A Adaptor Kit.

ACCESSORY CABLES

REMOTE SPEAKER/MICROPHONE TUNE-UP CABLE

This tune-up cable is used for aligning the remote speaker/microphone 450-470 MHz HT series radio.

NKE-6007A	Remote Speaker/Microphone Tune-up Cable.

HT-220 MICROPHONE ADAPTOR

Use this adaptor to convert the HT-220 remote microphone to standard four-conductor receptacle.

TEKA-77	HT-220 Remote Microphone Adaptor.
TEKA-79	HT-220 Universal Microphone Adaptor.

CABLE CONNECTOR ASSEMBLY

This assembly when used with the appropriate antenna adaptor allows a direct connection to a signal generator or mobile antenna (BNC to PL259 UHF).

1-80794A48	Cable and Connector Assembly.

ADAPTOR CABLE

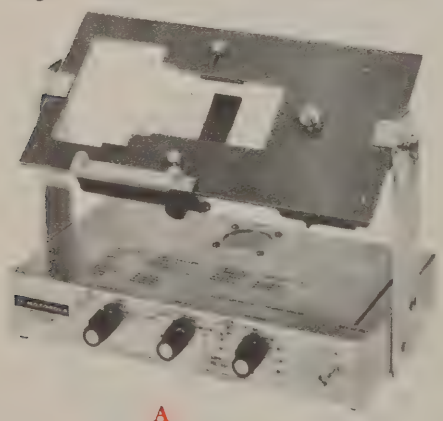
The NKN-6065A Adaptor Cable is supplied with a female receptacle and a miniature plug. It is used to connect the HT-220 or PAGECOM Pager to signal generator.

NKN-6065A	Adaptor Cable.

HT-90 AND HT-440 SERVICE AIDS

These cables provide the technician the ability to easily service the radio with the RTX-4005A Portable Radio Test Set.

RTK-4038A	Front Cover Cable.
RTK-4039A	Universal Radio Cable.



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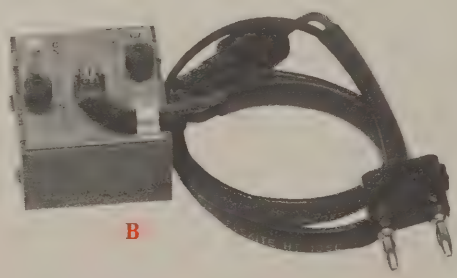

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HANDIE-COM SERVICE AIDS

HANDIE-COM RADIO TEST FIXTURE AND BATTERY ELIMINATOR

This test fixture provides a convenient cradle to hold the Motorola HANDIE-COM Radio for alignment and servicing. The fixture includes test jacks for RF input and audio monitoring, a keying device and a built-in speaker for acoustically coupling an audio signal into the unit.

The battery eliminator provides a convenient means of connecting to a bench power supply and can be used with or without the fixture. It is supported with a spring clip to hold the block firmly against the battery contacts.

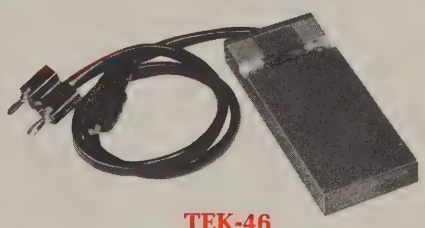
TEK-45	Test Fixture.
TEK-46	Battery Eliminator.
42-84200D26	Replacement Spring Clip for TEK-45.

TEK-45

PAC·RT TEST SET

This Test Set simulates the control unit/vehicular charger and mobile controls. It enables the serviceman to test the PAC·RT vehicular repeater separate from the mobile radio.

S-1351A	PAC·RT Test Set.



TEK-46

ALIGNMENT CABLE KIT

Provides facility for connecting the RF signal generator to the antenna input. Also allows reading the audi output on an AC Voltmeter.

NKN-6157A	Alignment Cable Kit.

S-1351A

NKN-6157A

PT SERVICE AIDS

S-1056 SERIES TEST SET ADAPTOR CABLES

A. The TEKA-52 Adaptor Cable allows PT-200, PT-300 or PT-500 radios to be tested with the S-1056C series test set. It permits the technician to measure the audio output of the receiver through the AC voltmeter portion of the test set and the audio input from an audio oscillator to the transmitter when making deviation checks and adjustments. It also provides a switch to "key" the transmitter.

TEKA-52 Adaptor Cable, PT-200/300/500.

B. Adapts the Motorola test set metering cable to be used with the PT-400 series portable radio. Cable consists of an 11-pin chassis receptacle that mates with the test set plug and is terminated on the other end with a 9-pin plug.

NKN-6099A Adaptor Cable.

C. This cable is necessary to properly align the final stages of the P33DEN transmitter. It provides a phone jack to permit the measurement of current drawn by the transmitter via a standard phone plug and cable used in conjunction with the Motorola test set. The TEKA-58 is provided with a 9-pin plug for connecting to the radio and a ¾" dual plug for connection to a DC Power Supply.

TEKA-58 Power Cable for P33DEN Series Radio.

RTX-4005A RADIO TEST SET

D. Provides capability for testing many transmitter and receiver functions on the PT500 radio. Transmitter modulation and keying can be simulated and receiver tests can be performed without opening the radio. Test set used in conjunction with test cable RTK-4013A for PT500 radio. Test set is not compatible with PT200, PT300, or PT400.

RTX-4005A Handie-Talkie Radio Test Set.
RTK-4013A Test cable for PT500 Radio.

WATTMETER LOADS

Wattmeter load P-7208 is used in conjunction with Motorola S-1056C series test set or 0-50 microammeter to measure transmitter RF power output. A calibration chart is supplied to use in correlating power dissipated in the load unit and the meter reading over the ranges of 25-50 MHz, 152-174 MHz, and 450-470 MHz.

P-7208 PT-200/300 High Band and PT-400 (60 Watt Dummy Load).

New low cost 8 watt RF wattmeter load usable to 512 MHz. With UHF male plug.

S-1361A RF Load.

RF dummy load plugs directly into antenna receptacle to provide visual indication of relative power output.

NLN-6145A For PT-200.
NLD-6060A For PT-300 High Band.

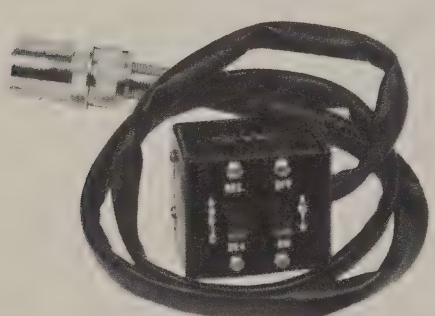
ACCESSORIES

These extension cables simplify bench servicing of PT-200, PT-300 and PT-500 radios. Just disconnect the power supply from the radio and reconnect the two units with the extension cable. Cables are 3 ft. long.

TEKA-28 Extension Cable for all PT-500 Radios and P-21, 23 and 31, 33DEN and DDN Series Radios.
TEKA-40 Extension Cable for P-21, 23, 31, 33DDC Series Radios.

The TEKA-53 Power Cable provides a convenient method of connecting the PT Series Handie-Talkie Radio to a DC power supply other than the battery pack. It can be used with all PT-500 radios and with the P21, 31DDC and the P23, 33DDC and DEN Series.

TEKA-53 Power Cable.



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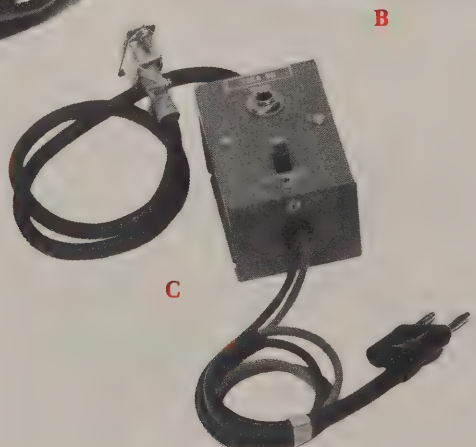

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MISCELLANEOUS TEST EQUIPMENT

4 CHANNEL SCAN TESTER

A. The TEK-42 Channel Scan Tester provides an interface between the power and noise sources and the scan monitor. It can be used to check the System 90 Channel Scans by using the appropriate cabling. Eliminates the need for a complete mobile installation. Additional equipment necessary for use with the TEK-42 tester are a power supply (Motorola S-1347D or S-1348D and a tone oscillator Motorola S-1067B). The TEK-42A is compatible with Private-Line Tone Coded Squelch.

TEK-42	Channel Scan Tester (includes connector cable 1-84201D65 for MOTRAC and MOTRAN radios).
TEKA-81A	Adaptor cable (optional for MICOR and MITREK Radios).

MICROPHONE TEST SET

B. The ST-855A Tester provides a complete audio power amplifier, tone oscillator and AC Voltmeter. Most standard Motorola mics can be tested simply by plugging it into the unit. The internal 1000 Hz oscillator and the built-in AC Voltmeter allows the mic. output level to be checked. The selector switch allows for using the amplifier and speaker to monitor the audio coming through the microphone.

ST-855A	Microphone Tester.
ST-868	Adaptor for Spade Lug Terminals.
TEKA-74	MICOR to 4-Prong Mic. Receptacle.
TEKA-77	Ht-220 Remote Mic. Adaptor.
TEKA-79	HT-220 Universal Mic. Adaptor.

DC/RF ALIGNMENT METER BATTERY OPERATION

C. An excellent instrument for aligning and testing pocket receivers and transmitters. The unit covers RF ranges of .5, 1, 5, and 15 V and DC ranges of .1, 1, 5, 15, 100 and 200 V. A removable DC/RF probe with a built-in selector switch enables you to meter points within the receiver and transmitter. Accessory cable (no. 1-855413) allows unit to be used as separate tuning meter.

TEK-7B	Alignment Meter w/Probe. Est. shpg. wt. 2 lbs. (.90 kg). Est. packaged dim. 8-¾ x 4¼ x 4¼″ (22.23 x 10.80 x 10.80 cm).
TEKA-39A	Repl. RF Probe. Est. shpg. wt. 4 oz. (112 gr).
01-855413	Accessory Cable. Est. shpg. wt. 3 oz. (84 gr).

CONVERTER-220 VAC to 117 VAC

D. This handy unit allows 117 VAC powered instruments to be operated from 220 VAC lines. Specifications: Input: 220 VAC, 50/60 Hz. Output: 117 VAC, 50/60 Hz at 8 ma max.

SKN-6009A	220 VAC power cable. Est. shpg. wt. 8 oz. (224 gr). Est. packaged dim. 5-¾ x 3 x 2″ (14.61 x 7.62 x 5.08 cm).

LOGIC MONITOR

E. The most convenient and efficient way developed to check digital IC's. Clip it over any DTL, TTL, HTL and Cmos dip IC up to 16 pins. Each contact connects to a single "bit" detector with high-intensity LED readout, activated when the applied voltage exceeds a fixed 2 V threshold. Logic 1 turns LED on; logic 0 (low voltage on open crt) keeps LED off. A power-seeking gate network automatically locates supply leads and feeds them to the logic monitor.

RTL-4015A Logic Monitor.

SPECIFICATIONS

Input Threshold: 2 V ±0.2 volts. **Input Impedance:** 100,000 Ohms. **Input Voltage Range:** 4 volts minimum 15 volts maximum across any two or more input leads. **Max. Current Drain:** 200 ma @ 10 volts. **Max. Input Frequency*:** 100,000 Hz 50% duty cycle.

*Will respond to signals up to 0.1 MHz when the input signal swing exceeds the threshold voltage by more than 15 volts.

LOGIC PROBE—FOR CMOS, DTL, TTL, RTL LOGIC—MOBILE DATA SYSTEMS, TELEPRINTER AND OTHER DIGITAL CIRCUITS.

F. For detecting and indicating logic levels and the presence and polarity of single pulses of very short durations. Indicator lamps provide an immediate visual indication of the condition existing in the circuit under test for step by step logic state testing. Simply connect to 5 V source and ground on the board being tested.

RTL-4014A Logic Probe.

SPECIFICATIONS

Input Impedance: 100,000 Ohms. **DTL-TTL Thresholds (Switch Selectable):** Logic 1 (HI-LED) −2.25 V ±.015 V; Logic) (LO-LED) −0.85 V ±.010 V. **HTL-CMOS Thresholds (Switch Selectable):** Logic 1 (HI-LED) −70% Vcc; Logic 0 (LO-LED) −30% Vcc. **Min. Detectable Pulse Width:** 50 nanoseconds. **Max. Input Signal Frequency:** greater than 10 MHz. **Pulse Detector (Pulse LED) (Switch Selectable):** High Speed pulse train or single events (+ or − transitions) activate ⅓ second pulse stretcher. **Pulse Memory (Pulse LED) (Switch Selectable):** Pulse or Level transition detected and stored until reset. **Input Overload Protection:** ±50 V continuous 117 VAC for less than 15 seconds. **Power Requirements:** 5 volt Vcc, 30 Ma; 15 Volt Vcc, 40 Ma; 36 Volts max., with power lead reversal protection.

WHIP LENGTH TESTER

G. Triple chrome plated, 3 section 96″ tube assembly mounted on marked stainless steel base adaptor. Used for testing proper whip length before cutting to frequency in 30 to 50 MHz band.

ST-599 Whip Length Tester.

INSTRUMENT ANTENNAS

H. Terminated in male BNC connector. Can be used with any deviation or frequency meter.

SAN-6000A	Antenna 8″ long.
TEKA-24A	Antenna 17″ long.
RTA-4000A	Telescopic antenna whip extends 18″—retracts to 8″.

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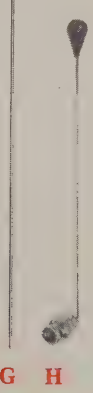
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PAGER SERVICE AIDS

RTL-1005A PAGER RADIATION TEST FIXTURE

One fixture serves as a radiation test fixture, holding fixture, and analyzing fixture. The RTL-1005A pager Radiation Test Fixture accommodates every Motorola manufactured pager back to PAGEBOY I. Use it to check radiation sensitivity measurement as well as for troubleshooting and aligning.

The side locator as well as the contact flap and metering pins can be adjusted to accommodate any pager smaller than the PAGEBOY I. For servicing in volume, the unit can be permanently set-up; for seldom seen pagers, it can be adjusted as required from unit to unit. The fixture comes with set-up and sensitivity correlation data for PAGEBOY I, PAGEBOY II, DIMENSION IV, METRX, PAGECOM, MINITOR, DIRECTOR, SPIRIT, METRO PAGEBOY, low band, high band, 450 and 800 MHz.

RTL-1005A Pager Radiation Test Fixture.

IF INJECTION ASSEMBLY

Use with RTL-1005A Pager Radiation Test Fixture provides means to couple signal directly useful in making stage-gain measurements.

RTL-4063A IF Injection Assembly.

RF INPUT ADAPTOR

Provides proper 50 Ohm termination to couple signal directly to pager. Required for METRX Pagers only.

TEKA-108 RF Input Adaptor.

AUDIO CABLE

Audio quieting cables are required for 20 dB quieting measurements, and may be required for providing 3.9 Ohm termination for connecting the audio output of a pager to an AC voltmeter. See Cross Reference Chart on Page 67 for model numbers.

ALIGNMENT HOUSING KITS

Provide standard pager housings which enable proper alignment of the pager in the Radiation Test Fixture. See Cross Reference Chart on page 67 for model numbers.

ANALYZING FIXTURE

Use to service pager boards outside of the pager housing. In addition to holding the circuit boards for convenient servicing, the test fixtures provide connections for power input, metering, RF, and audio for servicing. See Cross Reference Chart on page 67 for model numbers.

RTL-1005A PAGER RADIATION TEST FIXTURE

INTERCONNECT CABLES

Allows to PC boards in pager to be connected for servicing. See Cross Reference Chart on page 67 for model numbers.

SERVICE TOOL KITS

Contains alignment tool and accessories necessary for proper alignment of pager. See Cross Reference Chart on page 67 for model numbers.

PEAK DETECTOR FLAP

Provides proper RF injection and detection to A04FNC pager to align receiver front end. Used with TEK-67 amplifier and general purpose oscilloscope.

RTL-4076A Peak Detector Flap.

SERVICE ACCESSORIES

Other service accessories available to facilitate servicing are described below.

30-84875H01	RF adaptor cable incorporates female receptacle and jack to connect pager to signal generator.
58-80322A17	6 dB pad, 50 Ohm. Provides proper signal generator termination at radiation fixture input.
SLN-6435	Isolation transformer required for servicing DNC and FNC pagers and used in conjunction with RTX-1000A and RTX-1001A.
TEK-67	DC amplifier to permit alignment of A04FNC pagers using a general purpose oscilloscope having input sensitivity of 10 mV/div. or better.
TEKA-36	RF adaptor cable terminates phone-plug on one end and male UHF connector on other. Use with signal generator for receiver alignment.
TEKA-57	Audio Adaptor useful in measuring audio output in making 20 dB quieting checks. Consists of a 20-pin plug with slide switch for selection of proper speaker matching resistor (8 or 15 Ohms) terminates with a miniature phone plug for connection to a pager.

SERVICE AID KITS

These kits contain a number of service aids for ease of ordering.

RTX-1006A	For A03FNC Pager. Consists of: RTL-1005A, RTL-4063A, and TEKA-97.
RTX-1000B	For DVC series Pager. Consist of: RTL-1005A, RTL-4008B, and RSX-4003A.
RTX-1001B	For JVC series Pagers. Consist of: RTL-1005A, RTL-4022A, and RSX-4003A

PAGER SERVICE AIDS CROSS REFERENCE

Tone and Voice Pagers

Service Aids	Pager Model	A03DNC	A03FNC	A04FNC	A01EAC	A03EAC	A04EAC	H01EAB	H03EAB	H04EAB	A01GBC	A03GBC	A04GBC	A01DVC	A03DVC	A04DVC	A05DVC	A01JVC	A03JVC	A04JVC	BPR 2000
Radiation Fixture	RTL-1005A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Audio Cables	TEKA-83				X	X	X	X	X	X	X	X	X								
	TEKA-97		X																		
	TEKA-98			X																	
Alignment Housing	NEN-6077A	X																			
	NEN-6086A			X																	
	NEN-6087A		X																		
	15-84203D33					X															
	15-05391B01						X														
	15-05652D01							X	X	X	X	X	X								
	RTL-4008A													X	X	X	X				
	15-05202D01				X																
	RTL-4022A																	X	X	X	
	RTL-4084A																				X
Analyzing Fixture	TEK-50	X																			
	TEK-64		X																		
	TEK-65			X																	
	TEK-54				X	X	X														
	TEK-75							X	X	X	X	X	X								
Interconnect Cables	1-84203D32				X	X	X	X	X	X	X	X	X								
Service Tool Kit	NLN-6968A	X																			
	NLN-8473A		X																		
	ST-1158			X																	
	NLN-6245A				X	X		X	X		X	X									
	NLN-8542A						X			X			X								
	RSX-4003A													X	X	X	X	X	X	X	
Service Accessories	30-84875H01				X	X	X	X	X	X	X	X	X								
	58-80322A17	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	SLN-6435A	X	X	X										X	X		X	X	X		X
	TEK-67			X																	
	RTL-4076A			X																	

Tone Alert Pagers

Service Aids	Pager Model	A01CAC	A03CAC	A04CAC	A01MEC	A03MEC "A"	A03MEC "B"	A01MAC	A03MAC	A01TEC	A03TEC	A01AGC	A03AGC	A04AGC	A03BHC	A04BHC
RTL-1005A		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
NEN-6078A			X													
NEN-6079A					X											
NEN-6081A		X														
NEN-6083A					X											
NEN-6085B										X						
NEN-6089A									X							
NEN-6091A						X		X								
NEN-6094A							X									
NEN-8000A				X												
NEN-8002A												X	X	X	X	X
TEK-51			X													
TEK-56		X														
TEK-58				X												
TEK-60					X	X				X						
TEK-70									X							
TEK-71								X								
TEK-73							X									
TEK-78				X												
TEK-82 (1)												X	X	X	X	X
TEKA-109												X	X	X	X	X
NLN-8473A			X	X												
NLN-8512A						X	X									
NLN-8581A		X														
NLN-8607A					X											
NLN-8633A								X		X						
NLN-8943A							X		X							
ST-1158A				X												
ST-1358A												X	X	X	X	X
58-80322A17		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

NOTE: (1) Contains 5 trim pots to facilitate selection of proper resistor values and the following resistor kits are recommended for replacement of factory set resistors: RPX-4009A (mono trim R12), RPX-4010A (tone level R16), RPX-4011A (B + + R129), RPX-4012A (clock R122), and RPX-4031A (Battery check R120). Order interconnect cable TEKA-109 (receiver board to decoder board) separately.

TONE GENERATORS

R-1100A CODE SYNTHESIZER

The Motorola Code Synthesizer generates a number of two-tone sequential codes with stored timing intervals as well as a number of other selective signalling codes for servicing the following systems:

- **Tone only paging**
- **Tone and voice paging**
- **Tone only with battery saver paging**
- **Group call paging**
- **QUIK-CALL II signalling**
- **Single-tone burst**
- **PRIVATE-LINE continuous tone coded squelch systems**
- **DIGITAL PRIVATE-LINE coded squelch systems**
- **IMTS telephone dial encoding and 2805 Hz RCC interrupt dialing**
- **Tone Remote Base Signalling**

In addition, the unit can also be used as a 10 Hz to 9.999 kHz general purpose audio oscillator.

The correct time intervals and sequence for all standard Motorola two-tone sequential paging systems, as well as other signalling systems, are stored within the unit. You need only select the desired mode and insert the correct frequencies or other codes. The unit also has provision for temporarily storing the time intervals for up to two additional sequences for other types of two-tone systems. All stored frequencies and time intervals may be recalled and displayed at will. Telephone numbers and DIGITAL PRIVATE-LINE squelch codes are also displayed on the LED readout.

R-1100A Code Synthesizer.
R-1100AN With battery option.

See Page 27 for Complete Features and Specifications.

S-1335B TONE GENERATOR

The S-1335B provides a convenient means of selecting the proper 5 or 6 tone numerical code address signals required to test and troubleshoot METRO-PAGEBOY Pager receivers. The output of the tone generator is used to modulate and RF signal generator to simulate the tone burst on an RF carrier. The desired 5 or 6-tone sequence is set up easily and quickly with lever type digital switches. The output is available at standard ¾" spaced banana jacks.

The output level is adequate to modulate all Motorola Signal Generators. Output level is variable up to 15 volts peak-to-peak into a 5000 Ohm load. In addition to the lever type digital switches and the output level control front panel controls include a "start/stop" page pushbutton for initiating and ending the page sequence and a 3-position mode switch ("single" page, "repeat" page, and "level set") which provides a single 5-tone burst, continuous repeating bursts, or a single continuous tone for setting the output level to properly modulate the signal generator. A front panel male BNC connector labeled "sync" provides a synchronization pulse for triggering an oscilloscope.

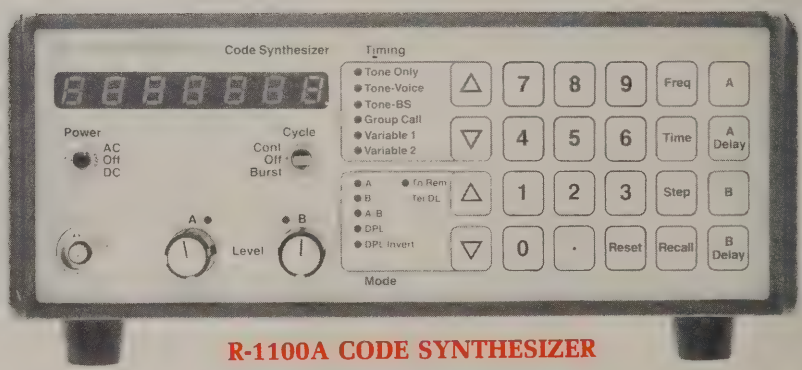
SPECIFICATIONS

S-1335B TONE GENERATOR

Modes: Single burst, repeat bursts, level set. Manual start/stop. **Program Switches:** 7 total. **Tone Frequencies:** 11 crystal controlled tone frequencies.

R-459 Hz	5-1305 Hz
0-600 Hz	6-1446 Hz
1-741 Hz	7-1587 Hz
2-882 Hz	8-1728 Hz
3-1023 Hz	9-1869 Hz
4-1164 Hz	X-X-2010.0 Hz

Output: Adjustable, 15 volts peak-to-peak into 5,000 Ohms. **Operating Voltage:** 115 VAC +10%.



R-1100A CODE SYNTHESIZER

S-1335B TONE GENERATOR

CCTV SERVICE AIDS

EXTENDER BOARDS

A. Used to service pc boards under operating conditions in the S-1264A and S-1267A encoder 2 wire control units, the S-1268A Decoder/Power Supply Unit, and IDS System.

Used in the S1264A-S1267A Encoder Control Unit:

SLN-6576A Extender board for extending the SLN-6557A encoder board.

TLN-5370A Extender board for extending SPN-6110A reg. +5.8 V power supply board, the SLN-6561A pan/tilt control board, the SLN-6563A zoom control board, the SLN-6564A focus control board, the SLN-6565A iris control board, the SLN-6566A site select readout board, the SLN-6571A universal encoder board, and the TLN-5011A digital clock board. Three TLN-5370A extender boards, are required, for servicing the SLN-6567A site select memory board, the SLN-6568A camera on/off board, the SLN-6589A camera on/off and site 1-10 select board and the SLN-6590A site 11-20 select board.

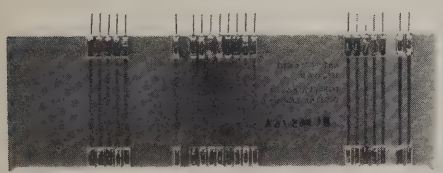
Used in the S1268A Decoder/Power Supply Unit:

SLN-6584A Extender board for extending the SLN-6559A digital receiver board.

TLN-5158A Extender board for extending the SPN-6109A zoom lens power supply board, the SLN-6560A multifunction decoder board, the SLN-6577A auto scan logic board, the SLN-6579A audio power amplifier board, the SLN-6591A audio intercom logic board, and the SLN-6580A universal decoder board.

Used in information Display System

SMM-1108A Extender board with 100 pin connectors for IDS.



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MULTIFUNCTION DECODER SERVICE BOARD

B. The Multifunction Decoder Service Board is used on 2-wire Decoder Unit S1268A to check both the SLN-6560A Multifunction Decoder Board and the SLN-6580A Universal Decoder Board(s). Its use will minimize troubleshooting time normally required to isolate a malfunctioning pushbutton control function (to a specific circuit board in the decoder/power supply unit). This is accomplished with the aid of twenty-two red LED's mounted on a plug-in type extender board. Eight of the LED's are mounted on the left side of the board, and labeled with the eight data bit line designators; 1-2-4-8-16-32-64-128. The remaining LED's are mounted on the right side of the board, and are labeled with fourteen standard pushbutton control functions as follows:

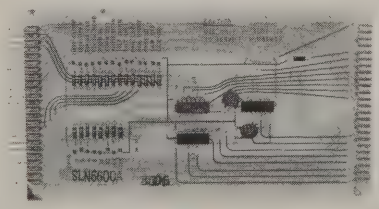
Iris Open/Iris Close, Focus Near/Focus Far, Zoom In/Zoom Out, Autoscan, Tilt Up/Tilt Down, Pan Left/Pan Right, Pass ID, and Cam On/Cam Off.

When a pushbutton for one of the control functions is depressed, the eight "data" LED's provide a composite visual indication of the (activated) control functions programmed 8-bit binary code. If the correct code is observed, it indicates that the control function has been received and decoded up to the input of the multifunction decoder board. If the correct code is **not** observed, conventional troubleshooting is required back to the input of the digital receiver board.

Once the correct 8-bit code has been observed on the "data" LED's, the correct "control function" LED should light. If it does, it indicates that the pushbutton control function has been decoded properly by the multifunction decoder board. If the correct "control function" LED does **not** light, it indicates a malfunction on the multifunction decoder board.

The multifunction decoder service board may also be used to check the 8-bit binary codes (only) of the universal pushbutton control functions. This is possible because the eight data bit lines that are routed to the multifunction decoder board, from the digital receiver board are also in parallel with the input to the SLN-6580A Universal Decoder Board(s). If the correct 8-bit universal code is observed on the "data" LED's it indicates the malfunction to be on the universal decoder board(s), or with associated external components.

SLN-6600A Decoder Service Board.



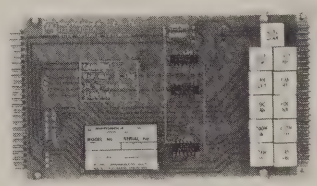
B

DIGITAL DECODER FUNCTION SERVICE BOARD

C. For use on 2-wire Digital Decoder Unit S1268A. Service board incorporates eleven pushbutton switches and built-in buffer and interface circuitry to allow a technician to perform manual functions at the **decoder site.** Functions are pan left-right, tilt up-down, zoom in-out, focus near-far and camera on/off. The service board allows quick system analysis of decoder operation.

To use, simply unplug the multifunction decoder board SLN-6560A from the J8 slot, plug-in the service board and then plug the multifunction decoder board into the top of the service board.

RTL-4031A Decoder function service board.



C

R-1015A BAR/DOT GENERATOR

FEATURES

- **Generates standard pattern for monitor alignment and Troubleshooting Triax and Coax Transmission lines.**
- **Designed to drive up to 5000 ft. of Triax cable at IV p-p composite video.**
- **Both VCS (visual communications systems) and IDS (information display systems) operable at selectable horizontal sweep frequencies of 15,750 Hz and 15,360 Hz respectively.**
- **Lightweight, easy to carry, and battery operated for field use.**

R-1015A BAR/DOT GENERATOR

The Motorola Portable Video Bar/Dot Generator is a small portable television test generator designed for convenient field use in the testing of television cable transmission systems and proper adjustment of display devices. The unit is powered by two internal 9 volt alkaline batteries and is especially useful in outdoor, on-site testing where power is not readily available.

The output is a non-interlace composite video with industrial sync pulse format and provides selectable patterns for use as a reference in the adjustment of size and linearity of television display devices. Precise "crosshatch," BAR, DOT, horizontal only bar, and vertical only bar patterns are provided. The number of horizontal and vertical elements in the patterns is switch selectable in 3 fixed combinations.

Nominal output levels are 0.7 volt video (including blanking pedestal), plus 0.3 volt sync pulses. The generator is source terminated for proper drive of 75 Ohm coaxial Triaxial line.

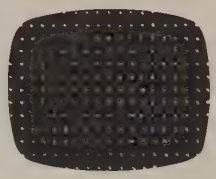
R-1015A Portable Video Bar/Dot Generator.

SPECIFICATIONS

Functions: Bar, dot, H bar, & V bar in selectable format of horizontal and vertical elements of 21 x 15, 11 x 7, & 1 x 1. **Output Video Signal:** Format: Composite video. Level: 0.7 volt video +0.3 V sync. Polarity: White positive. Impendance: 75 Ohm, source terminated. Level: 3 V p-p (unterminated). Coupling: Direct (DC) baseline at ground potential. **Line Rate (Horizontal Sweep Frequency):** Switch selectable, 15, 750 Hz standard VCS (video communications systems) or 15, 360 Hz IDS (information display systems). **Field Rate (Vertical Sweep Frequency):** Switch selectable, 60 Hz VCS or 58 Hz IDS. **Output Connector:** SO 239 (UHF). **Power Requirement:** 18 VDC at 22 mA via 2 internal 9 V alkaline batteries. Provides approximately eight hours operation. **Size:** 1½" H x 3½" D x 7½" L. **Weight:** 1½ lbs. **Operating temperature:** 0° to 50°C.

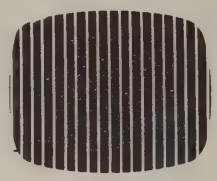
FOUR PATTERNS

BAR PATTERN of crosshatched white lines equally spaced on a black background is useful to check linearity of display devices.



DOT PATTERN is an array of small white dots on a black background that helps when adjusting and checking scan linearity and is also useful in checking convergence of color display devices.

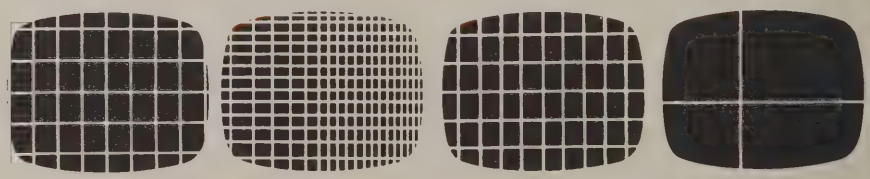
H-BAR PATTERN of only horizonal lines is a good way to check midfrequency response. Pattern locks to raster lines so that each bar line is stable.



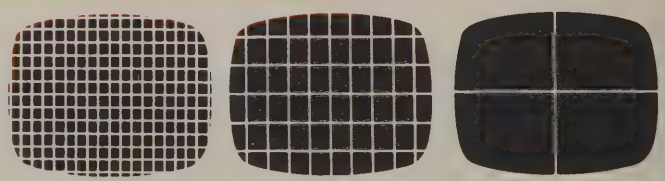
V-BAR PATTERN of only vertical lines is a good way to check your system's high frequency video response.

COMMON CCTV PROBLEMS TO LOOK FOR . . . . . .

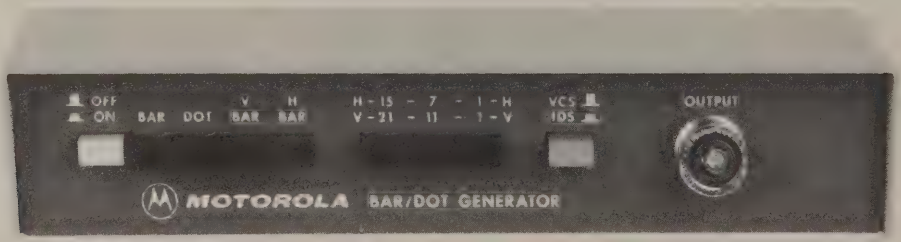
OVERSCAN *POOR LINEARITY* *POOR VIDEO RESPONSE* *OFF CENTER*



THREE FORMATS FOR EACH PATTERN



enables you to view each of the four test patterns in three different formats. Far left screen shows the overall format of the BAR pattern which is especially useful for checking display linearity. Mid-range format on center screen is an ideal way to check display size and detect overscan. Close-up format on the far right screen shows only one horizontal and vertical element which provides an exact reference for checking display centering.



R-1015A BAR/DOT GENERATOR

CCTV TEST EQUIPMENT

VISUAL COMMUNICATIONS TEST EQUIPMENT AND SERVICE AIDS

SEE APPROPRIATE CATALOG PAGE FOR COMPLETE FEATURES AND SPECIFICATIONS.

VARIABLE POWER SUPPLY

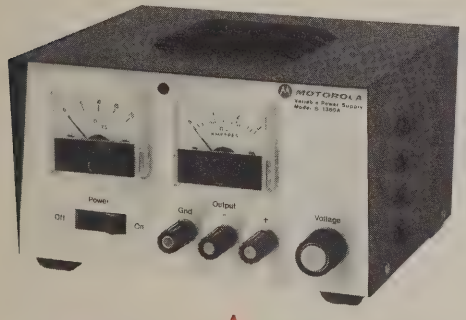
A. Variable DC output from 5-18 volts at 3 amps makes this power supply ideal for servicing low power circuits. Separate voltage and amp meters allow you to continuously monitor operating conditions. Regulation is ±0.5%, with ripple and noise less than 1.0 mV RMS, short circuit protected.

S-1360A Variable Power Supply

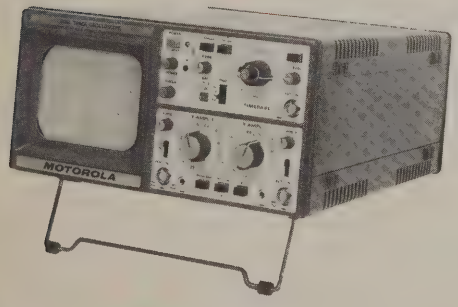
DUAL TRACE OSCILLOSCOPE

B. Ideal for visual communications and information display system servicing, this oscilloscope provides stable sweep triggering. A vertical bandwidth of DC to 20 MHz with accuracy of ±3% is more than adequate for most service shop requirements.

R-1029A Oscilloscope
RTL-4011A x1 Probe
RTL-4012A x10 Probe
RTL-4013A x1/10 Switchable Probe



A



B

FET VOM

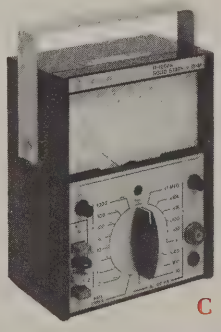
C. The Model R-1008A Solid-State, Volt-Ohm-Milliameter, with LP Ohms, offers an exceptionally wide range of measuring functions in a portable unit. This unit allows accurate measurement of 0.05 V auto target setting under field and bench servicing conditions. It has been designed for ease of operation with an easy-to-use push-button selection of measuring functions. Frequency compensated from 50 Hz to 50 kHz and supplied complete with leads, alligator clips, batteries and instruction manual.

R-1008A FET VOM.

DIGITAL MULTIMETER

D. A very versatile instrument that offers wide-ranging capability at a low price. Highly reliable LSI circuitry features bi-polar operation and automatic zero. The unmistakable 3½″ digit readout features 0.43″ LED's. All ranges and functions are selected with convenient pushbuttons. Twenty-eight ranges are available. This unit may be powered by 110 VAC or four "D" cells. An automatic battery charger is built in. Available extras include a rugged carrying case and accessory probes.

R-1001A Digital Multimeter.



C

D

LOGIC MONITOR

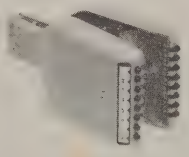
E. The most convenient and efficient way developed to check digital IC's. Clip it over any DTL, TTL, HTL or Cmos dip IC up to 16 pins. Each contact connects to a single "bit" detector with high-intensity LED readout, activated when the applied voltage exceeds a fixed 2 V threshold. Logic 1 turns LED on; logic 0 (low voltage or open circuit) keeps LED off. A power-seeking gate network automatically locates supply leads and feeds them to the logic monitor.

RTL-4015A Logic Monitor.

LOGIC PROBE

F. For detecting and indicating logic levels and the presence and polarity of single pulses of very short durations in Cmos, DTL, TTL, RTL logic circuits. Indicator lamps provide an immediate visual indication of the condition existing in the circuit under test for step-by-step logic state testing. Simply connect to 5 V source and ground on the board being tested.

RTL-4014A Logic Probe.



E

F

CALIBRATION AND REPAIR CENTER

The Test Equipment Calibration and Repair Center services all test equipment supplied by the Motorola Communications Group. The center maintains a stock of original equipment replacement parts and a complete library of service information of all Motorola test equipment. Qualified instrument technicians are specifically trained on various individual units. Extensive "inhouse" resources include a rubidium beam frequency standard continuously calibrated to WWV and an environmental chamber for temperature cycling as well as spectrum analyzers, a storage oscilloscope, and other standard instrumentation.

FREQUENCY STANDARDS

Frequency meansurement is an essential element of two-way radio servicing and most frequency measuring instruments should be recalibrated at intervals of six months to one year depending on the aging characteristics of the master oscillator. The Motorola Test Equipment Calibration and Repair Center is fully prepared to provide this service and certify your instruments traceable to the U.S. National Bureau of Standards via WWV.

TELEPHONE TROUBLESHOOTING

The Test Equipment Repair Center also provides a convenient telephone trouble shooting service. Frequently, a user technician can trouble shoot a piece of equipment and isolate defective components under the direction of the Test Equipment Repair Center via telephone.

Required replacement parts are then immediately shipped to the user thereby reducing shipping time and servicing costs.

For telephone trouble shooting contact the Test Equipment Repair Center which can be reached on (312) 576-7025 or 1-800-323-6967.

WARRANTY

Warranty coverage on Motorola Test Equipment is one year parts and labor from date of shipment. This warranty is extended to the original purchaser only. In the event of a defect, malfunction, or failure during the period of warranty, Motorola, at its option, will either repair, or replace the product, provided that Motorola receives written notice specifying the nature of the defect during the period of warranty, and the defective product is returned to Motorola Test Equipment Repair Center, 1313 E. Algonquin Rd., Schaumburg, IL 60196, with transporation prepaid. Proof of purchase and evidence of date of shipment (packing list or invoice) must accompany return of the defective product. Transportation charges for the return of the product to the Purchaser will be prepaid by Motorola.

Most in-warranty repairs are performed at the center. Exceptions include repairs on some equipment not manufactured by Motorola which are performed by the original supplier under the direction of the Test Equipment Repair Center. Out-of-warranty service is performed on a time and materials basis at competitive rates and the maximum turn-around goal is less than ten working days. Customer satisfaction is continually surveyed by reply cards returned with repaired instruments.

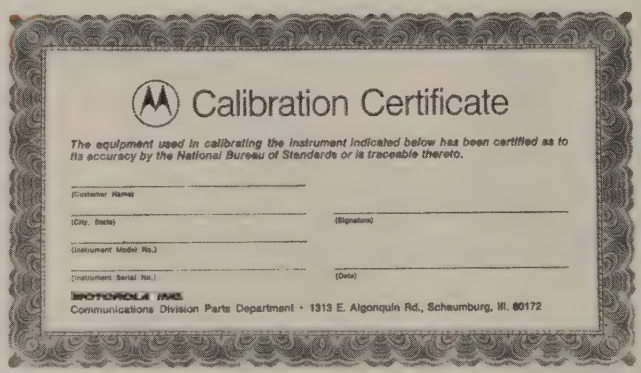
MODULE EXCHANGE

A module exchange program has been established for Motorola Communications System Analyzers. Once the defective module has been determined (through substitution or telephone troubleshooting) a replacement module can be ordered on an exchange basis. The exchange modules have been reconditioned at the Repair Center and are available at very reasonable rates.

USED EQUIPMENT

Some used Motorola Test Equipment is available for sale. This equipment has been reconditioned at the Repair Center and carries a three month parts and labor warranty. Please contact your local Area Parts Office (Test Equipment Consultant) for prices and sales information.

The extensive capabilities of the Test Equipment Repair Center represent another example of the in-depth back up support available when Motorola Test Equipment is purchased.


Calibration Certificate

The equipment used in calibrating the instrument indicated below has been certified as to its accuracy by the National Bureau of Standards or is traceable thereto.

(Customer Name)

(City, State)

(Signature)

(Instrument Model No.)

(Instrument Serial No.)

(Date)

MOTOROLA INC.
Communications Division Parts Department • 1313 E. Algonquin Rd., Schaumburg, Ill. 60172

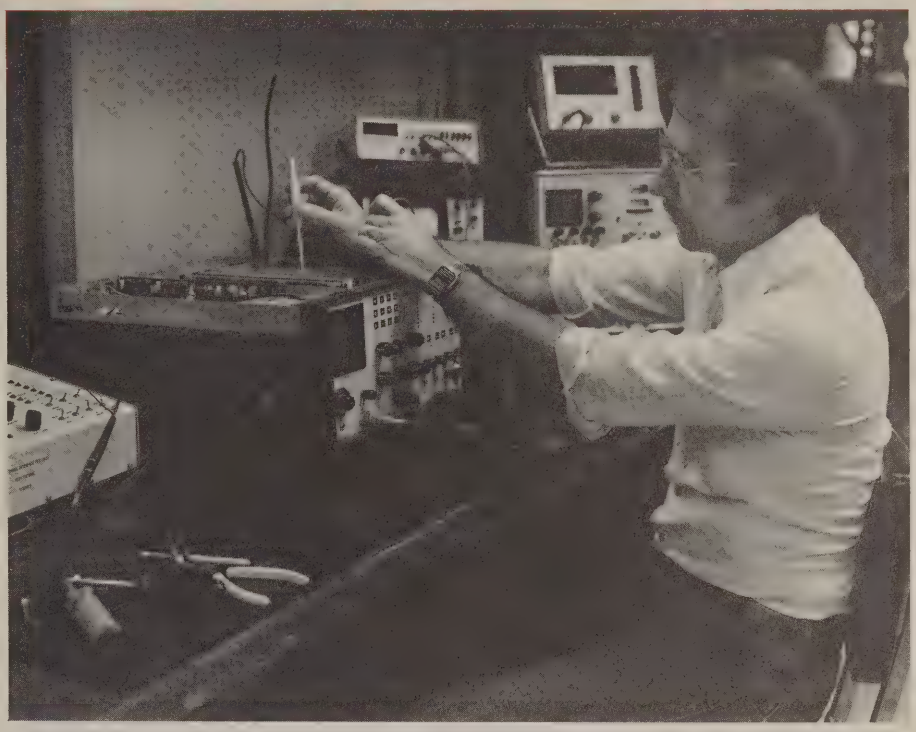
Frequency Measuring Instruments should be recalibrated at six months to one year intervals depending on aging characteristics of the master oscillator.

TEST EQUIPMENT CALIBRATION AND REPAIR SHIPPING PROCEDURES

When shipping, please enclose the information indicated below and package equipment carefully to avoid damage. Damage claims which result from improper packaging will not be honored by the carrier.

1. Complete model number and description of equipment including cables and other accessory items.
2. Complete description of service desired, i.e., calibration or repair. Indicate the trouble with the unit to the best of your knowledge. Please include your telephone number.
3. Shipping and invoicing addresses and purchase order number where applicable.
4. Motorola customer and tag number, if known.
5. Special shipping considerations, if any.
6. Date of purchase and Motorola order number if equipment is within warranty.
7. Ship equipment to:

   Motorola C & E
   Motorola Test Equipment
   Repair Center
   1313 E. Algonquin Road
   Schaumburg, IL 60196



One view of the Test Equipment Repair Center.

Incoming repair orders are logged on-line in the computer system so your order can be tracked easily and quickly.

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